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GOLD MEDAL THESIS.

INAUGURAL DISSERTATION

ON THE PRESENCE OF

AIR IN THE ORGANS OF CIRCULATION,

SUBMITTED TO

The Medical Faculty of the University of
Edinburgh,

IN CONFORMITY WITH THE RULES FOR GRADUATION,

BY AUTHORITY OF

THE VERY REV. PRINCIPAL BAIRD,

AND WITH THE SANCTION OF

THE SENATUS ACADEMICUS.

1 AUGUST, 1837.

TO

THE REV. JOHN CORMACK, D.D.

MINISTER OF STOW,

THIS INAUGURAL DISSERTATION

IS AFFECTIONATELY DEDICATED

BY HIS SON,

THE AUTHOR.

EDINBURGH: *1st August*, 1837.

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INTRODUCTION.

THE amount of physiological knowledge derived from experiments on the inferior animals would unquestionably have been more extended and accurate than it really is, had experimenters been more desirous to give exact accounts of what they saw, and less anxious to form ingenious hypotheses and hasty generalizations of facts. It is to be lamented that this itching after novelty has led some most distinguished men to commit another and a much more serious error than that to which reference has now been made —I allude to a practice with which the French in particular are chargeable, viz. that of describing their experiments in inflated language, using fanciful and exaggerated expressions in recording the effects of the various physiological agents they have employed—thus rendering their observations in a great measure useless—indeed in some cases it may be, worse than useless.

Much unnecessary slaughter of animals might certainly be avoided, were experimenters more careful to record their observations in that plain unvarnished language which alone is suited to scientific details. This observation has been naturally suggested by the consideration of the subject of the following Essay.

Bichat exceedingly exaggerated the deleterious effects produced upon the animal economy by the introduction of air into the veins, asserting that a bubble of air introduced into a vein occasioned immediate death. This statement the subsequent experiments of Nysten, Magendie, Blundell, and others have proved to be utterly erroneous. Nysten found that a small quantity of all the various gases with which he experimented, including nitrous gas and sulphuretted hydrogen, might be introduced into the circulation without occasioning death;[1] and, as will appear from experiments afterwards to be detailed, I have injected large quantities of air into the veins of dogs and rabbits without the manifestation of any decided effect.

For the sake of perspicuity, it seems necessary to arrange the great variety of topics to which our attention is demanded, under some leading heads; and with this view the following Thesis is divided into four chapters, each being to a certain extent a separate Essay.

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[1] Nysten:—Recherches de Physiologie et Chimie Pathologiques, p. 152. Paris: 1811.

CHAPTER I.

EXAMINATION OF THE PHYSIOLOGICAL CHANGES WHICH TAKE PLACE IN THOSE CASES IN WHICH DEATH IS THE ALMOST IMMEDIATE RESULT OF THE ADMISSION OF AIR.

When air or any gas is introduced into the circulation *in sufficient quantity to cause rapid death*, the symptoms which precede the fatal event are in general pretty uniform, as are also the appearances observed on dissection. The animal suddenly falls down, utters some cries, and speedily expires in convulsions. The most striking and constant phenomenon observed after death is the presence of air and frothy blood in the heart, and also very frequently in every part of the circulatory apparatus.

There are a number of cases on record of patients dying on the operating-table from air entering a divided vein; and many other instances of sudden and unexpected death in similar circumstances, which were at the time of their occurrence considered inexplicable, may, probably with correctness, be referred to this cause; and some instances of sudden death after parturition are now occasionally explained on the supposition of air entering by the uterine sinuses. The not unfrequent occurrence of these untoward events renders our subject one of peculiar interest, independent of that which must ever be excited by the examination of so curious a point in physiology; for the important inquiry is naturally suggested:—Can nothing be done in such emergencies? The question cannot be satisfactorily answered at present: till we have seen the order in which the vital processes are arrested, we cannot hope to be able to discover the method of averting the catastrophe.

The baneful effects of the injection of air into the blood-vessels were known to Wepfer and others among the older pathologists;[1] but it was Dupuytren who first pointed it out as the cause of some of those sudden deaths which take place during surgical operations. Since the publication of his observations on this subject, many such cases have been described by surgeons in Great Britain, on the Continent, and in America.

Wepfer killed an ox by blowing into the jugular vein; and is believed to be the first who made such an experiment.

As far as I am aware, the physiological effects caused by the introduction of air into the veins were first made the subject of experiment in this country by Brown Langrish, and described by him to the Royal Society of London about the year 1746. This enthusiastic experimental physiologist arrived at the conclusion to which Nysten so long afterwards came, viz. that the circulation is arrested in the heart.

Brown Langrish, upon opening the thorax of a dog, which he had killed in a few seconds by "propelling sulphurous air towards the heart" through the jugular vein, found the right auricle and ventricle greatly distended with air and almost destitute of blood. The cavities of the left side were collapsed. Believing "that the death of the dog was owing to the resistance which the air gave to the return of the blood through the venæ cavæ, and not to any particular action of the sulphureous fumes on the blood itself," he threw a similar quantity of pure air into the jugular vein of another dog, and found that death ensued as suddenly as in the previous case.[1] As there is no account given of the post-mortem appearances, we may conclude that they were similar to those found in the first experiment.

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[1] The following, among the older authors, have noticed this subject:—Wepfer, Redi, Bohn, Vander, Camerarius, Brunner, Harder, Sproegel, Lieutand, Morgagni, Spallanzani, Valsalva, Rudolphi, &c.

In more recent times, the subject has been investigated by Bichat, Magendie, Nysten, Piednagel, Leroy, Wing, and others. There is a great deal of discrepancy of opinion among these authors; and therefore we shall now examine the respective merits of the various theories which they have propounded.

Bichat believed that death was occasioned by the contact of air with the brain. Nysten maintains that the arrest of the vital functions depends upon the distension of the right side of the heart with air—that death commences at the right side, and that the cessation of the contractions of the left is a secondary result. Leroy at one time supposed that emphysema of the lungs is the sole cause of death; but he afterwards modified this opinion, and suggested the three following ways in which death may take place from the introduction of air into the veins:—1st, By affecting the sensibility of the brain or by acting mechanically upon that organ: 2d, By producing sudden emphysema of the lungs: and, lastly, By depriving the heart of arterial blood. Piednagel conceives that a change in the structure of the lungs is the principal cause of death.[2]

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[1] BROWN LANGRISH:—Physical Experiments upon Brutes, p. 152. London: 1746.

[2] PIEDNAGEL:—Journal de Physiologie, tome ix, p. 79, et seq.

Magendie at one time held that emphysema of the lungs was one of the causes of death; but as he does not allude to it in the most recent publication where he notices this subject, it seems probable that he now agrees with Nysten, especially as he brings forward nothing but what indicates such an acquiescence.

The opinion of Bichat, that the air acts as a poison on the brain, appears to have been the result of hasty or inaccurate observation. This opinion we seem fully warranted in expressing, when we find the distinguished physiologist stating so egregious an error as that a single bubble of air produces an instantaneously fatal result. This theory is based upon the following facts and observations:—1st, The circulation goes on for some time after the introduction of air into the veins: 2nd, Air propelled upon the brain through one of the carotids causes death: 3rd, Convulsions precede death: 4th, The venous capillaries are full of blood mixed with air; and, fifthly, The cases of sudden death mentioned by Morgagni, in which air was found in the vessels of the brain, strengthen the theory.

Subsequent inquiries appear to give almost no support to the views of Bichat; and indeed facts and observations furnish a poor foundation for the sweeping theory which he has attempted to rear upon them. Perhaps his strongest fact is that death is preceded by convulsions, phenomena which must unquestionably arise in consequence of an impression made upon the central organs of the nervous system. But then, it may be fairly asked:—Are not these convulsions secondary results? They occur in almost every case of violent death, and in numerous instances can be clearly traced to a primary affection of the heart or lungs. Leroy alleges that convulsive movements are rarely to be witnessed. It may occasionally happen that they are not seen, but I am perfectly satisfied that in at least the great majority of cases they do take place. In most of the cases in the human subject which occurred during operations, there is express mention made of them (as well as in experiments made upon animals); and when the circumstance is not noticed, we have no right to conclude that it did not take place. I have been assured by my friend Professor Dick, of the Edinburgh Veterinary College, that although he has killed many horses by blowing air into the veins, he does not recollect a single instance in which death was not preceded by violent convulsions. But be this as it may, the presence of the phenomenon in question cannot be held as proving that the brain is the organ primarily affected; for, in whatever manner the supply of blood to the brain is suddenly diminished, convulsions follow.

The notion of some, that a sudden emphysema of the lungs is the cause of death, at first sight appears plausible, and is certainly very ingenious; but upon examination it will, I think, be found untenable. When a large quantity of air was thrown directly into the right auricle by Piednagel and Magendie, the former states that respiration all at once ceased, and that the heart's pulsations became strong and rapid. On dissection, the lungs were found in an emphysematous state and the right side of the heart distended with air, the left cavities containing only a little frothy blood.

Piednagel gives the following account of the manner in which he supposes these appearances to be produced. He conceives that the air contained in the air cells, by means of its pressure, prevents that mixed with the blood in the minute ramifications of the pulmonary artery from passing onwards; that this resistance which the heart meets with in attempting to propel the blood through the lungs, acts upon it as a stimulus, and, by redoubling the force of its contractions, breaks up the tissue of the lungs. It is urged as an argument in favour of emphysema being the cause of death, that air when introduced gradually and in small quantities produces very slight effects. But it is obvious that it by no means follows that when death does suddenly take place from the entrance of a large quantity of air, it is caused by emphysema of the lungs. In the first place, emphysema is far from being a constant appearance, as will appear from cases and experiments to be detailed; and when found, it can be accounted for in a much more simple way than that proposed by Piednagel.

Dr. Wing killed a rabbit in a few seconds by the forcible injection of air into the external jugular vein, and upon opening the chest the lungs were found collapsed; and besides it is stated, that in every respect they were in a natural condition.[1] I have suddenly distended the right auricle in the manner described by Magendie and Piednagel, but emphysema of the lungs was hardly ever observed, though the experiment was often repeated. In one or two cases the structure of the lungs certainly seemed somewhat broken up; but this might be, and in all probability was, produced by the convulsive attempts at respiration which preceded death, just as happens in many cases of poisoning with strychnia and other substances.

No one, so far as I am aware, has attempted to show that the amount of emphysema found in animals killed with air is sufficient of itself to produce a sudden and violent death. Till this is done, the theory of Leroy and others on this subject must be considered visionary, since all the facts with which we are acquainted are obviously opposed to it.

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[1] WING:—Boston Medical and Surgical Journal, as quoted in the Lançette Française for March, 1835.

It is impossible to distinguish between old and recent emphysema, so that in some of the instances in which it has been found, there is reason to suppose that it may have been of some considerable standing. We know that people with very extensive emphysema of the lungs may attain an advanced old age without necessarily suffering any great inconvenience; but what bears still more upon this point is, that extensive and sudden emphysema is often occasioned by a fit of whooping-cough, and yet we see no symptoms produced analogous to those caused by the entrance of air into the veins. From all these considerations, then, the hypothesis of Leroy, Magendie, and others on this subject, appear wholly unsupported by facts—and must consequently be abandoned.

That the air sometimes proves fatal, by depriving the heart of its supply of arterial blood through the coronary arteries, appears to be a very visionary doctrine. I cannot recollect any facts which give it even a semblance of truth.

Another very questionable doctrine is that of Pigeaux, who denies that the entrance of air is the sole cause of death, and considers that much of the deleterious consequences may be attributed to the injury sustained by the small nervous branches.[1] Surely this is an absurd supposition.

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[1] PIGEAUX:—Gazette Médicale for March, 1833.

With a view of elucidating the question proposed for consideration in this chapter, the following experiments were performed.

First Experiment.—The subject of this experiment was a horse about seventeen hands high, and in pretty good condition, which was condemned to death on account of an incurable cancer of the foot. A tube, a quarter of an inch in diameter, was introduced into the left jugular vein. The man who blew, filled his chest twice, and continued to blow for a minute. He then stopped on account of the symptoms of uneasiness which the animal exhibited. In a few seconds the horse staggered and fell, and in three minutes from the commencement of the introduction of air was quite dead. During the period he survived after falling, he made great and violent efforts to inspire, and during that time was strongly convulsed, the convulsions commencing soon after he fell. It was computed that he lost about eight quarts of blood, which is the quantity usually taken at an ordinary venesection.

The chest was opened an hour and a half after death, when the lungs were seen collapsed, and in no degree emphysematous. All the cavities of the heart, but particularly the right auricle, were distended, and had a tense elastic feel. The right side was first examined. The auricle was enormously distended, and, upon a small opening being made with the scalpel, frothy blood, with which this cavity seemed to be entirely filled, instantly rushed out. The greater part of the ventricle was filled with fluid and coagulated blood, but there was also some in a frothed state. The left auricle contained frothy blood and some coagulated masses. In the left ventricle the quantity of air was just sufficient to make its existence appreciable; but there was a great quantity of blood, both fluid and coagulated, in this cavity. Air was found in every visible vein over the whole body.

Dr. John Reid and Mr. William Scott were present with me at the performance of this experiment.

SECOND EXPERIMENT.—A tube about equal in diameter to a crow quill was inserted into the right jugular vein of a rabbit. In the course of two minutes I introduced three or four full expirations. During this time the animal lay quite tranquil, and did not struggle in the least, but the breathing was difficult, and the heart's action feeble and fluttering. Just as I desisted from blowing, I observed some slight convulsive movements of the limbs, and in a few seconds more they recurred. Respiration had now ceased, and there were no more convulsions.

The thorax was immediately laid open. Great venous congestion everywhere presented itself. The heart was enormously distended. Upon puncturing the right auricle and ventricle, air unmixed with blood issued forth, and in the auricle there was a good deal of frothy blood. The froth was not nearly of so light a consistence as in the former experiment, owing probably to the blood and air not having had sufficient time to be thoroughly agitated together. The left side of the heart contained fluid blood. It is worthy of remark that the irritability of the heart was almost extinct. Even though rapidly relieved of its load of blood and air, the contractions excited by pricking it with the knife were unusually trifling. In the horse again, the contractions of the heart continued very forcible long after it had been cut out of the body. The lungs were next examined, and were found to be quite healthy. They were collapsed, and in no degree emphysematous. In the vena cava and some of the larger abdominal veins, bubbles of air were observed; but in most of the other vessels examined, none could be detected.

My friend Mr. Thomas R. Scott assisted me in performing this experiment.

Since in both of these experiments the structure of the lungs was in no degree broken up, we must refer the cause of death either to the heart or to the brain. In both instances, the convulsions indicating an affection of the brain, appear to have been secondary results. The immediate cause of death was the stoppage or derangement of the heart's action as a consequence of over-distension of its walls. It is probably in the agonies of death, and in those cases where the heart's action at that time becomes quickened, or, as is frequently the case, assumes an irregular or vermicular movement, that the frothing of the blood takes place. The appearance is by no means uniform, and I have seen the blood and air wholly unmixed.

The following experiment shows that air may be thrown into the jugular vein with great violence, and yet no emphysema be produced.

THIRD EXPERIMENT.—A tube having been inserted in the jugular vein of a dog, a large quantity of air was introduced suddenly and with great force. The time occupied was about six seconds. At the end of that time, the vein was so distended with air that no force employed was sufficient to cause any more to enter. I was just proceeding to tighten a ligature round the vessel, when the animal began to struggle, and after uttering some cries, expired in twelve seconds from the time the introduction of the air commenced.

The chest was immediately opened. *The lungs presented their usual appearance.* The heart was greatly distended, and—from its engorged state—was contracting very feebly. The right side of the heart was full of light frothy blood. The inferior *cava* contained little blood, but was much distended with air, as were to a greater or less extent most of the venous trunks of any considerable size. The coronary veins presented the same appearance as the inferior *cava.* In the veins of the hind legs were observed a few bubbles of air. All over the body there was great congestion of the venous system. There was no air in the left side of the heart. The obvious explanation of these phenomena is, that the air had been sent directly through the right auricle into the inferior *vena cava* and coronary veins; for its absence from the left side of the heart clearly indicates that what was found in the veins had not made the round of the circulation. From this experiment then it appears that very great force may be used without producing any emphysema, and it may beadded, as a circumstance worthy of note, that there was but little frothy blood in the pulmonary artery.

One not acquainted with the appearance usually presented by the lungs of rabbits, might easily suppose that there was emphysema when these organs were nevertheless in their ordinary condition. For what seems to be the healthy state of the rabbit's lungs bears a very close resemblance to emphysema in the human subject. It is therefore not so satisfactory to make this experiment on a rabbit.

In the experiment last described I was assisted by my friends Messrs. Thomas R. Scott and William Scott.

The phenomena both before and after death described as having been seen in individuals who have died suddenly on the operating table, from the accidental admission of air, fully bear out the views now stated.

The first case of the kind which attracted general attention, happened in Paris in 1818. It is particularly interesting and valuable, from the circumstance that the appearances detected on dissection were quite different from those expected—the belief being that the right sac of the pleura would be found full of air. Beauchère was removing a tumour from the right shoulder. When detaching the last adherent portion with the bistoury, a peculiar sound was suddenly heard, similar to that caused by the entrance of air through a small opening into the thorax of a living animal. It was the opinion of all present that the pleura had been wounded. The patient exclaimed, "*mon sang tombe dans mon cœur! je suis mort!*"—he became pale, his head fell backwards, the eyes were fixed, and he could not distinguish objects. Respiration was easy but loud, and seemed to be performed chiefly by the left lung, the movements on the right side of the chest being very feeble. The pulse was extremely small, frequent, hard, and irregular. The whole body was covered with a cold sweat, and there were some convulsions. All restorative measures failed; and the patient died a quarter of an hour after the fatal cut had been given.

On examining the body eighteen hours after death, the chest was found to contain a quantity of red coloured serum. The lungs were free from all disease;—they crepitated and filled both thoracic cavities. There was no opening into the right pleura. On examining the seat of the operation, it was found that the jugular vein had been wounded. In fact, a portion of this vessel—half its calibre and an inch in length—had been cut out. The wound in the jugular vein terminated at its point of junction with the subclavian vein. The superior vena cava contained no blood: its internal membrane was red. The pericardium was filled with serosity. None of the cavites of the heart contained any blood. The left side seemed to be in a natural state:—perhaps the ventricle was a little thickened. The walls of the right cavities were flabby, very thin, pale, and of a much greater calibre than those of the opposite side. The brain presented a grey appearance, and all its blood-vessels of a size sufficient to be visible were distended with air. The aorta, crural arteries, and inferior vena cava contained air mixed with blood.

An event of a similar nature to that now detailed, happened at the Hôtel Dieu in Paris in 1822, when Dupuytren was removing a tumour from a girl's neck. A sound, similar to that heard in the former case, led the operator to remark that, had he been cutting in the neighbourhood of the air-passages, he would have supposed that he had made an opening into some of them. No soooner had he said this, and at the same time given the last stroke of the knife which concluded the separation of the tumour, when the patient exclaimed, *I am dying*, was seized with a general trembling, and quickly expired. All the usual methods resorted to for the recovery from syncope and asphyxia were tried without any success, though persevered in for several hours.

The body was examined twenty-four hours after death. The right auricle was found distended with air so as to give it an elastic tension, and when an incision was made through its parietes, the air escaped in great quantity without any admixture of blood : it nevertheless contained a small quantity of uncoagulated blood. The other cavities of the heart—which were healthy—the arteries and veins throughout the body, and the membranes of the brain contained fluid blood mixed with air. The lungs were red, pliable, crepitant, elastic, and perfectly healthy. There was no wound in the trachea. The serous membrane of the brain was thin and transparent, without serosity and without injection. The cerebral tissue was firm, uninjected, and with the colours well marked. Red spots were observed on the stomach, some of them evidently owing to injection of the capillaries. The muscles were firm and red.

In neither of these cases are there any facts of importance to support the hypothesis of Bichat. The presence of air in the vessels of the brain sinks into insignificance, when we discover that it is also found in every minute artery and vein all over the body. The existence of emphysema of the lungs in Beauchère's case, may fairly be considered as purely accidental. In the operation cases detailed, as well as in others of a similar nature on record, the emphysema was in all probability produced by the artificial respiration. It is almost impossible to perform this process without to a greater or less extent breaking up the air cells. Both in my own hands and in others more expert, I have uniformly seen some amount of emphysema produced when endeavours were made to recover animals by artificial respiration. Perhaps it is from serious injury being done to the lungs, that so few infants resuscitated by this method survive more than a few days ; and I think there is reason to fear that the rude apparatus frequently employed by unskilful persons for the recovery of those apparently drowned, is the cause of so little advantage being derived from artificial respiration in such cases.

The following case may be classed with those of Beauchère and Dupuytren already described. When Mr. Barlow of Blackburn, Lancashire, was removing a tumour from the side of the neck of a delicate lady, and was "proceeding to dissect aside the skin to get at the basis of the tumour, a sudden and unexpected hissing gurgling noise rushed obviously from a large divided empty vein, and the patient expired instantly, without either sigh, groan, or struggle. Every effort to restore animation was fruitless. This unexpected event," Mr. Barlow goes on to remark, "was truly appalling to all present, for scarcely an ounce of blood was lost on the occasion, and her death was then wholly attributed to a state of debility and syncope, which opinion I acknowledge remained unchanged till I accidentally met with the case of Dupuytren."[1]

A fatal case of a similar nature occurred to Dr. Warren of Harvard University, when removing a cancerous mamma of Nancy Bunker. The vein through which the air entered was the subscapular. As the phenomena preceding death were quite similar to those already described, and as there was no *post-mortem* examination, a detail of the case would throw no additional light on the subject, and is consequently omitted.[2]

Accidents in consequence of the entrance of air into the circulation, have occurred to the following operators: Sir Astley Cooper of London; Mr. Barlow of Lancashire; Mr. Simmonds of Manchester; MM. Dupuytren, Beauchère,

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[1] BARLOW:—Medico-Chirurg. Transactions, vol. xvi, p. 29.

[2] WARREN:—Medical Gazette, vol. xii, p. 270.

Clemot, and Roux, of Paris; Drs. Mott and Stevens of New York; Dr. Warren of Harvard, U.S.; Dr. Castara of Lunéville; M. Delpech of Montpellier; M. Graefe of Berlin; M. Goullard of Lyons; and doubtless to many others by whom the cases have not been put on record. Indeed it is surprising, that so many of these accidents should have been published during the comparatively short period that has elapsed since Dupuytren first turned the attention of the medical world to the subject.

There are various circumstances which render it possible that in some instances in which women die unexpectedly after parturition, and when all seems going on well, death is owing to air entering the circulation by means of the open mouths of the veins communicating with the uterine sinuses. Ollivier asks whether those cases of unexpected death after parturition may not be explained in this way.[1] These orifices, immediately after the separation of the decidua, are very large. They have been made the subject of investigation by many modern as well as old anatomists and obstetricians, and upon the whole the various descriptions correspond. Burton says, that the uterine sinuses "in the ninth month of gravitation are so large as to admit the end of the biggest finger; and their orifices that open into the cavity of the womb, will at the same time admit the end of the little finger."[2]

As the uterus not unfrequently contracts and expands alternately with considerable energy after the expulsion of the fœtus, it is quite reasonable to suppose that air may sometimes be sucked into the gaping mouths of the uterine vessels in sufficient quantity to prove fatal to a female exhausted with the fatigues of labour.

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[1] OLIVIER:—Article, AIR in the Dictionnaire de Médecine, 2me edition.

[2] BURTON:—New System of Midwifery, p. 19. Ed. 1751. Dr. R. Lee claims the discovery of these orifices: the above quotation shows that he is in error in doing so. In the Medical Gazette, vol. xii, p. 202, priority of discovery is discussed.

Le Gallois mentions three female animals, upon which he was making experiments with a view of observing the effects of abstinence and loss of blood, in which sudden death took place from air entering the circulation by the uterine veins.[1]

Baudelocque[2] states, that in examining the bodies of patients who had died of uterine hæmorrhage in the hospital of *La Maternité*, he constantly found a gaseous substance in the arteries. This he assigns (apparently without any reason) as the cause of the convulsions which precede death. He states that he has no doubt but that the gas is spontaneously generated. This opinion may or may not be correct, for it is at least possible that the air may be admitted from without, since the bleeding depends upon the imperfect closing of these sinuses; and as in cases of uterine hæmorrhage after labour, convulsive contraction and dilatation of the uterus are not uncommon, the possibility of death being occasioned by the air drawn in by this sucking power is at least entitled to consideration. It must be admitted, however, that with the scanty light which the records of pathology are yet able to throw upon this point, it would be rash to give any decided opinion upon the subject.

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[1] Le Gallois:—Ann. Hebdom. de Méd., vol. iii, p. 183. Paris, 1829.

[2] Baudelocque:—Traité des Hémor. Internes de l'Uterus, p. 66. Bruxelles, 1832.

In a case recorded by Leclerc—which occurred in the practice of Dubois and Boyer—we can hardly conceive that the air was drawn in by the process above suggested. Madame B—, a delicate lady, who had for some time suffered from a dull pain in the left inguinal region, was suddenly seized with hæmorrhage from one of the uterine vessels, and died in the course of three hours. Upon examination of the body, various morbid appearances were noticed; but what particularly demands attention is, that there was no blood in the heart, that the inferior *vena cava* contained air alone, and that the peritoneum was in some places emphysematous.[1]

There is no mention made as to the interval which elapsed between death and the examination, nor is it stated at what season of the year the event took place; so that it does not appear with what degree of probability the presence of air in the blood-vessels may be explained by supposing that decomposition of the blood had taken place. It must also be remembered, that in death from hæmorrhage it is not unusual to find air in the veins. Mery states that if the blood of an animal be drained out from an opening in the inferior vena cava, the veins fill with air in proportion as they empty of blood, and that the air comes from the smaller into the larger veins.[2] Nysten says that this is by no means a constant result, and that it depends upon a large sized opening being made in the vessel.[3] I have repeated Mery's experiment, but have not found any air in the circulation, though I made a large aperture in the vein.

Another question suggested by the above considerations is, whether air generated within the body during life is not sometimes the immediate cause of death; but this topic is not here discussed, because it appears that it may be more naturally attended to afterwards.

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[1] LECLERC:—Archives Générales de Médecine, xviii, p. 281.

[2] MERY:—Mémoires de l'Académie des Sciences, an. 1707, p. 167.

[3] NYSTEN:—*Op. cit.*, p. 4.

In conclusion then, it may be stated as clearly established, that when a quantity of air, by entering the circulation, proves suddenly fatal, the immediate cause of the arrest of the vital functions is the inability of the right side of the heart to contract and expel its elastic contents—air and frothy blood; and, therefore, all the phenomena which follow are consequences of this first cause.

CHAPTER II.

CIRCUMSTANCES WHICH MODIFY THE EFFECTS. OBSERVATIONS ON CASES IN WHICH DEATH DID NOT TAKE PLACE, OR WAS A SECONDARY RESULT.

It has already been stated that very considerable quantities of air may be introduced into the circulation without producing death. The concurrent testimony of a variety of experimenters establishes this fact beyond the possibility of doubt. Sometimes the patient to whom the accident happens, or the animal experimented upon, suffers only transient inconvenience, or makes a complete recovery; and in other instances death ensues so late as some days after the admission of the air. Two very interesting subjects of investigation are thus presented to our notice. In the first place: What are the circumstances which thus modify the result? And then: What is the nature of the modifications which occur under these varying circumstances?

First, let us attend to the different modifying causes. They appear chiefly to be referable to three heads:

1st, the Quantity of air admitted;

2nd, the Rapidity of its admission;

3rd, the Situation of the orifice through which it enters.

For the sake of perspicuity, each of these points will be separately illustrated.

1st, That *the result is modified to a very great extent by the Quantity of air admitted* it is unnecessary to insist upon at any length. The experiments of Nysten, Magendie, Wing, and others, clearly show that it is only when introduced in considerable quantity that there is a fatal issue. Of this I have satisfied myself by repeated experiments. The same fact has also been stated by Dr. Blundell in his memoir on the transfusion of blood. It is probable that when slowly introduced, the oxygen is either in whole or in part absorbed, and that the volume of the elastic fluid is thus materially diminished. That such absorption does really take place there can be no doubt; for the experiments of Christison distinctly prove that the oxygenation of the blood is a purely chemical process, and that even out of the body venous blood absorbs a large quantity of oxygen, and changes its purple for a florid hue.[1]

Nysten infers from various experiments that some of the injected gas may be thrown off by the lungs.

It appears, however, that a large quantity of air may enter the heart, and nevertheless no such phenomena be manifested as took place in the cases and experiments already detailed. This statement is founded upon the following.

FOURTH EXPERIMENT.—Six or seven full expirations were injected though a small tube into the jugular veins of two dogs. A little difficulty of breathing ensued, but this soon passed away. At the end of half an hour the animals were killed. Up to that time they had seemed pretty lively, and exhibited almost no symptoms of uneasiness.

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[1] CHRISTISON (Robert):—Edinburgh Medical and Surgical Journal for January, 1831.

Upon examining the chest immediately after death, the lungs were in both instances found collapsed and free from emphysema. The heart, particularly in one instance, was greatly distended with air, and had an elastic feel. In both instances, when the scalpel was thrust into each of the cavities of the heart, a little air unmingled with blood rushed out with a whizzing noise. Not the slightest trace of frothing could be detected—a circumstance which, by the way, it may be remarked, tends to corroborate the view formerly suggested, that the frothing of the blood is caused by the irregular motions of the heart which sometimes immediately precede or follow death.

My assistants in performing this experiment were my friends James Y. Simpson, John H. Pollexfen, and William Scott.

In the experiments described in the first chapter, almost the whole calibre of the vein was occupied with the tube, and death ensued in a very few minutes. In the cases of the two dogs just detailed, a good deal of blood was allowed to flow down the vessel along with the air; and hence it was, I apprehend, that the baneful effects were so little apparent.

2*d*, It may be stated as a general conclusion that *the greater the Rapidity with which the air is introduced*, *and the greater the diameter of the tube through which it passes*, *so much the more sudden and deleterious is the result.* This appears obvious from various statements already made, and it is therefore unnecessary in this place to supply additional illustrations.

In those cases of operation in which a fatal termination almost immediately ensued, it seems evident, that owing to a thickening of the coats of the vein, or from other causes afterwards to be stated, the vessels were unable to collapse. If the vessels be thus kept in a patulous state, it is easy to understand the rapidity with which the right side of the heart will become distended with air; for when a vessel in such a state is cut across, air, and air only, will pass down it.

The effect produced *when great force is used in blowing*, is well illustrated by the experiment upon a dog, mentioned in the first chapter. [Third experiment.] In that case, the right side of the heart was suddenly and violently distended with air; and death took place with the greatest conceivable rapidity.

It was probably owing to the great force used that the following experiment proved fatal; for certainly the small quantity of air injected was not of itself sufficient to produce the result. Bassereaux, when assisting Bretonneau to inject pus into the jugular veins of dogs, happened upon one occasion imperfectly to fill the syringe. The canula was introduced into the vein, and the piston pressed down; but before the liquid had entered the circulation,—and dissection showed that not a drop of pus had been injected—both gentlemen heard a distinct "*gargouillement.*" The experiment was instantly stopped, and *in half a minute the animal fell down* on its side, in strong convulsions. The respiration was laboured and stertorous, and *death took place in two minutes.* Upon dissection, *only a few bubbles of air were found in the right auricle*, which was almost entirely gorged with blood. My principal object in mentioning this case is, to point out that it does not tell in favour of the doctrine of Bichat.

3*d.* The only modifying circumstance proposed for consideration, is *the situation of the orifice through which the air enters.*

Magendie made the curious discovery, that when air is injected into one of the branches of the *vena portæ* no inconvenience seems to result from the operation. This must obviously depend upon some change which the air undergoes in its passage through the portal circulation. It is either absorbed, or it becomes so intimately mixed with the blood, as to be rendered incapable of causing any impediment to the circulation.

FIFTH EXPERIMENT.—I threw a quantity of air into one of the mesenteric veins of a rabbit; and in eight minutes afterwards killed the animal. The liver was in a state of almost complete anæmia, and upon slicing it, minute bubbles of air appeared at every point on the incised surfaces. There was no air apparent in the heart, nor in any part of the body except the liver.

My assistants in this experiment were Thomas Rennie Scott and William Scott.

Having thus very briefly considered the principal circumstances which modify the effects resulting from the admission of air into the circulation, it still remains for us to attend to the precise nature of the modifications presented under these varying circumstances.

We have seen that *quantity* modifies the result to a very great extent; but to what extent I am unable to state, as I have killed one animal with much less than was required to destroy another apparently similar in strength and size. As a vast number of experiments would have been necessary before anything like a satisfactory average result could be obtained, I was not long in perceiving the necessity—in the meantime at least—of abandoning this part of the investigation. This was done with the less reluctance, that the point is not of essential importance, and is one which only admits of being elucidated in an imperfect manner.

Very violent effects may be produced by the injection of air into a vein, and yet the animal operated upon may spontaneously recover. For example, Wing threw by degrees a considerable quantity into the jugular vein of a sheep. At each stroke of the piston of the syringe, a gurgling sound was heard in the heart, and there occurred slight difficulty in breathing and strong convulsions. The experiment occupied ten minutes. When the animal was released at the end of this time, he manifested a desire to eat, and mixed with the rest of the flock.[1] Similar experiments have been previously described by Nysten and others.

The cases which prove fatal after the lapse of some days afford a most interesting and important subject of inquiry. In some instances death is owing, as Nysten's experiments prove, to an affection of the lungs. This able experimenter states that when the air is not in sufficiently large quantity to put a stop to the vital functions by arresting the contractions of the right side of the heart, it is forced into the minute ramifications of the pulmonary artery, where it produces obstructions causing pneumonia, which may terminate in death, occurring sometimes so late as the third or fourth day. In a case belonging to this class, the following are the *post-mortem* appearances described: the examination was made two hours after death. The pleuræ presented their natural appearance, but the lungs were of a greyish colour, mixed with brown spots, somewhat gorged with blood, and much distended with frothy mucus. There was not a single bubble of air in the heart, nor in any of the blood-vessels. Both ventricles contained blood, and in these cavities there were small yellow semi-transparent concretions. Nysten observed a similar state of the lungs in repeated experiments of the same nature.[1]

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[1] WING:—Boston Medical and Surgical Journal, as quoted in the Lançette Française, for May, 1835.

I was anxious to verify these experiments of Nysten, but was never lucky enough to obtain a case at all resembling those which he details as perishing from secondary thoracic symptoms, though I had several instances of spontaneous restoration to health after the injection of a large quantity of air. There was one rabbit in which I fully anticipated consequences such as he describes, but complete and speedy recovery took place. I subjoin an account of the experiment.

Sixth Experiment.—A large quantity of air was injected into the jugular vein. Very violent effects were produced—so violent indeed that the animal seemed for twenty minutes to be in a moribund, or at least in a very critical state. To our astonishment, however, it gradually came round; and in about an hour respiration, which was at first very laboured, became tolerably natural and the rabbit was soon little out of sorts. In a few hours afterwards the breathing, as far as I could judge, was quite natural, and the animal took food with avidity. I kept this rabbit for sixteen days, and never observed anything wrong with it excepting an abscess which formed near the seat of the operation.

Upon dissection, immediately after killing it, the lungs were found to be perfectly healthy. There was no air in any of the blood-vessels.

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[1] Nysten :—Op. cit., p. 36, &c.

I was assisted in this experiment by Thomas Rennie Scott and William Scott.

It is the opinion of some, that death may take place after the lapse of several days from the time the air has entered the vessels, and yet be attended with all the striking phenomena usually presented when the fatal event is an immediate consequence. I am not aware of any facts which at all justify such a supposition; but as the notion is entertained, it is right to mention it.

The following case is interesting; but unfortunately it does not throw any very positive light upon this part of the subject, since, by assuming either view as correct the phenomena may be satisfactorily explained. The case, however, is important as showing that although the most formidable symptoms be manifested and immediate death seem almost inevitable, the patient may notwithstanding speedily rally. This presses upon our attention the important fact, that if the heart be in any way sufficiently disencumbered of the air, it may regain its natural action; and the circulation, after having been all at once violently disordered, and almost arrested, may in a few minutes go on as before the accident. Thus we perceive the practical bearing of our inquiries, and have held out to us a good ground of hope that some useful rules of treatment may be suggested by an attentive consideration of this branch of the subject.

But to proceed: — Roux, when removing a tumour situated on the cellular sheath surrounding the common carotid artery, jugular vein, and pneumogastric nerve, made an opening into the jugular vein. Upon inspection after death, it was found that the vein had been wounded transversely, and that on account of the morbid thickening of its walls, the inferior aperture was gaping. At the moment the operator lifted up the tumour to enable him to dissect it out, a sort of whistling noise was heard, like that produced by the entrance of air into the empty receiver of an air pump. The patient uttered a plaintive cry, and became greatly agitated—the contractions of the heart were hurried, the pulse was weak, respiration long and laboured, and at length, after one protracted inspiration followed by a short and hasty expiration, symptoms of approaching death were manifested. By preventing the admission of any more air, by the employment of frictions, the application of stimulants to the nostrils, and dashing water on the face, the circulation and respiration were restored. The dissection was discontinued, and the tumour enclosed in a double ligature. All went on well till the seventh day; but on that morning, the patient suffered from oppression, difficulty of speech, then from coma, and died during the night.

An autopsy was made. The eighth pair of nerves were found uninjured. Both lungs were slightly congested, and emphysematous spots were observed under the pulmonary pleura. The cavities of the heart were empty. On puncturing the abdominal and thoracic aorta in different places, a great many bubbles of air escaped, mixed with bloody serum, and the same could be observed, but in less quantity, in the iliac arteries.[1] There was no air in the vessels of the brain.

The narrator of this case asks whether the non-occurrence of death till the seventh day was owing to the small quantity of air admitted during the operation, or to a fresh quantity having entered immediately before death owing to the inferior opening of the vessel still remaining gaping on the surface of the wound. He conceives that the frothy serum found in the bronchial cells, and the emphysematous spots noticed under the pulmonary pleura, render the latter supposition plausible. Granting that the emphysema was produced by air which entered the wounded vein, it is just as likely to have been caused by air entering at the operation as afterwards; and as for the frothy serum, it is by no means an unusual post-mortem appearance in many diseases. The absence of the difficult breathing and other characteristic phenomena described as ushering in death from the admission of air into the veins, throws a good deal of obscurity over the nature of the case, and appears to render it highly probable that there were some causes operating which do not appear in the narrative. Might not the oppression and coma depend on something quite different from air in the circulation, such as phlebitis, or inflammation of some important organ? Be that as it may, the air might have entered, owing to the slipping of the bandages, immediately before, or to a certain extent during the death struggles.

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[1] Abridged from the Dublin Journ. of Med. and Chem. Science, vol. iv, p. 475. Vide also Puyderat's account of this case in the Journ. Univ. et Hebdom. Tome xi, p. 165.

It appears, at all events, that if sudden death do not follow the admission of air, and if immediate danger be averted, there are disasters still to be dreaded, the most important of which are inflammation of the lungs, the admission of more air, and perhaps also the danger of phlebitis from injury done to the vein in the operation or from the violence of the measures adopted to prevent immediate death.

CHAPTER III.

ON THE CAUSE OF THE ENTRANCE OF AIR INTO VEINS DIVIDED DURING OPERATIONS: WITH SOME CONSIDERATIONS ON THE MEANS MOST LIKELY TO AVERT DEATH IN SUCH CASES.

THE only condition absolutely necessary for the admission of air during an operation is, *that the vein be kept in a patulous state*, for when in this condition, the movements of the chest in respiration—assisted perhaps by the tendency in the right auricle to form a vacuum during its diastole—are sufficient to cause the air to enter. Sir David Barry's experiments show that during inspiration a suction influence is exerted upon the blood in the veins entering the chest. Now when this suction is exerted upon the contents of a wounded vein *incapable of collapsing from disease of its coats or any other cause,* these contents, whatever physical properties they present, must be under the influence of the same law which was pointed out by Sir David Barry with regard to the blood in unopened vessels. Should the vein be completely severed, it is evident that air, and air only, will pass down to the heart; but if, on the other hand, the vessel be merely wounded, there will be a mixture of blood and air.

The patulous state of the vein may depend on two causes:—1*st*, The vessel may be gaping in consequence of a rigidity of the coats caused by disease; or, 2*nd*, It may be kept open by the constrained position of the patient, or the manipulations of the operator and his assistants.

Bérard, I am aware, ascribes the phenomenon chiefly to the anatomical peculiarities of the vessels independent of disease.[1] He has shown that the large veins near the heart have fasciæ closely adherent to their coats, and that these fasciæ are attached to bones. This connection, he believes, is of such a nature as to prevent the collapse of the veins. One decided objection to this explanation is, that the entrance of air by no means always follows a wound of these vessels; and seeing that the admission of air is not a necessary consequence of a wound of a vein provided with such a fascia, how can it be established that this fascia is in any one instance the cause of the entrance of air? The anatomical facts pointed out by Bérard cannot, therefore, be regarded as explaining why veins sometimes remain uncollapsed in spite of the suction power of the heart and chest and the influence of atmospheric pressure; but they may be viewed as to a certain extent favouring the occurrence of the phenomenon.

It is not, however, only by the great vessels in the neck that air has been known to enter. Air entered the saphena of a patient upon whom Dupuytren was operating; and when Clemot was removing a tumour from the breast of a female, it entered a divided vein, in consequence of which the woman died a few hours after the operation. Upon dissection, the right side of the heart was ascertained to be distended with air.[1] "In an attempt which I made," says

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[1] BERARD:—Archives Générales de Médecine, for June, 1836.

[2] Lançette Française, for 30th November, 1830.—CLEMOT there details the particulars of two other accidents of a similar nature, which

Dr. Mott, "to remove the parotid gland in an enlarged and scirrhous state, the facial vein where it passes over the base of the lower jaw was opened in dissecting the integuments from the tumour in the early stage of the operation, before a single artery was tied. At the instant this vessel was opened, the attention of all present was arrested by the gurgling sound of air passing into some small opening. The breathing of the patient immediately became difficult and laborious. The heart beat violently and irregularly, his features were distorted, and convulsions of the whole body soon followed to so great an extent as to make it impossible to keep him on the table. He lay upon the floor in this condition for nearly half an hour, as all supposed *in articulo mortis*. As the convulsions gradually left him, his mouth was permanently distorted, and complete hemiplegia was found to have ensued; an hour or more elapsed before he could articulate, and it was nearly a whole day before he recovered the use of his arm and leg."[1]

In most cases on record, we may infer, from the descriptions given, that there was a diseased state of the coats of the vessels; but at the same time, a peculiar and constrained position of the parts might, as has already been stated, keep a vein in such a state as to allow of a large quantity of air being sucked into it. Such is the explanation which must

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occurred in his own practice. In one case he was dissecting out a tumour from the axilla, and in the other tying the subclavian artery. GOULLARD of Lyons, when removing indurated glands from the axilla, wounded the axillary vein. Only a small quantity of blood was lost; but in an instant the patient became pale, the muscles of the face were convulsed, hiccup came on, which in a few minutes was followed by death. There was no *post-mortem* examination. DUPLAT:—Gazette Médicale, Dec. 1833.

[1] Med. Chirurg. Journ. Lond. vol. xvi, p. 33.

be given of the appearances observed in the case of a student who committed suicide in this city some months ago, by cutting his throat. There was almost no blood lost; and upon examination, the heart was found to contain air in all its cavities. I am informed there was no thickened condition of the veins of the neck observed.[1]

In the transfusion of blood, air may be, and doubtless often has been injected into a vein; but if the operation be performed with very ordinary dexterity, it is difficult to imagine how a quantity sufficient to produce disastrous consequences could be thrown in. Blundell, who has carefully examined this point, says, that "it seems probable that the entrance of a few drachms of air into the vessels would be attended with considerable distress, and even danger; but it must be recollected, that if the operation be carefully performed by a competent person with a proper instrument there can be no risk of air entering the vessels in large quantities; and the probability is, that a bubble or two of air would occasion little if any inconvenience."[2]

The interest and importance of a physiological investigation are greatly enhanced, when we enter upon it with a hope of being able to deduce useful rules of practice from our observations; and it is the belief of the author that his subject is possessed of this attraction. It has appeared, from what has already been advanced, that the deleterious effects resulting from the entrance of air during operations are purely mechanical, and that the death of the patient depends simply upon the contractions of the right side of the heart being arrested, or greatly impeded, in consequence of the presence of that elastic fluid. Hence, it is naturally suggested that the means most likely to afford safety to the patient will consist in relieving the heart with the greatest possible expedition—an inference, it may be remarked, which points out the practical importance of studying the order in which the vital functions become arrested.

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[1] [This case (of which the above is an incorrect account) was afterwards published by Dr. P. D. Handyside and was commented upon by me in a pamphlet first published in 1838, and now reprinted in this volume.]

[2] BLUNDELL:—Ashwell's Practical Treatise on Parturition. Appendix by Dr. Blundell, p. 538. London, 1828.

We are also strengthened in the hope of being frequently able in this way to save the patient, by a knowledge of the astonishing advantages which result from opening the jugular vein in certain cases of poisoning in which the deleterious agent produces a sudden but merely transient arrest of the contractions of the heart, and where death seems to result from this stage being rendered permanent, in consequence of the distension which has taken place during the period of temporary inaction. We generally find that in such cases, by promptly relieving the congestion of the heart, its contractions are in the course of a few seconds renewed, and speedily go on with nearly their usual regularity; but if this be not done, the animal generally dies very quickly, the circulation being greatly impeded or wholly arrested by the mechanical distension of the heart with blood. The intervention of the valve does not prevent a reflux current, as it might be supposed to do, so that this important principle admits of easy application both in cases of engorgement with blood and in cases in which air is the distending agent.

Haller, both in his Physiology and in his treatise on the Movement of the Blood, distinctly states that the right side of the heart can be emptied by opening the jugular vein. He believed this to be entirely owing to derivation of blood, and as in no way dependent upon the contractions of the heart. This view was also adopted by Spallanzani, who repeated the experiments of Haller. The flow of blood from vessels opened at a distance from the centre of the circulation certainly appears to depend entirely upon derivation; but when large veins near the heart are opened, there seems also to be another cause in operation. This was first stated by my friend John Reid, in a paper which he published in the 127th number of the Edinburgh Medical and Surgical Journal. He conceives that the unloading of the heart, when the jugular vein is cut into, depends upon two causes—one being the derivation of Haller, and the other the contractions of the right side of the heart. In cases of extreme engorgement, the latter cause can only come into operation as a consequence of the former.

"At each contraction," John Reid remarks, "the heart attempts to force a certain quantity of blood along the vessels connected with it, and as there is no *vis a tergo* to prevent the action of the heart moving the blood along the veins in its immediate neighbourhood, a certain quantity is forced out through the opening in the jugular." Of the accuracy of this statement I am perfectly satisfied, having witnessed the phenomenon in the experiments detailed by John Reid and also in the cases of different animals which I have since killed in various ways.

I have endeavoured by a detail of experiments to show the advantage resulting from a copious depletion by the jugular vein in cases of poisoning with creasote.[1] I have since extended the inquiry to other poisons, and in particular have made farther observations for the purpose of elucidating this point more fully with regard to creasote and prussic acid—substances which in large doses unquestionably prove fatal, by producing a sudden arrest or derangement of the movements of the heart.

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[1] CORMACK (John Rose):—Treatise on Creasote, pp. 84, 85, and 92. Edinburgh, 1836.

Since the cause of death, both in poisoning with these substances and from the entrance of a large quantity of air into the right side of the heart, is the same, viz. the inability of the heart to overcome the distension, it does not seem inappropriate to detail the following experiment which illustrates most beautifully the beneficial effects of copious depletion, when a poisonous dose of prussic acid has been administered.

SEVENTH EXPERIMENT.—A free opening was made in the jugular vein of an ordinary-sized pointer dog; and hæmorrhage was prevented by means of pressure. A dose of prussic acid was then administered, of such strength as to contain about a drop of the real acid. The animal became almost immediately affected, uttered some faint cries and in twenty seconds fell down, lying for a few seconds motionless on the floor. He then began to struggle as if in the agonies of death; but the vein now broke out, and the blood flowed in a rapid and copious stream. Immediately the dog showed signs of returning vigour. He raised his head, then in a few seconds looked around him, and his eyes, which were formerly dim and suffused, regained their natural lustre. From this time he rapidly recovered, and began to lick up his own blood. At the end of an hour he did not seem much out of sorts, and was then killed, the experiment being regarded as perfectly satisfactory.

In the performance of this remarkable experiment, I had the assistance of my friends John H. Pollexfen and William Scott.

That this experiment was satisfactory, I have not the slightest doubt. I have seen at least fifty or sixty dogs killed outright with prussic acid—with doses often smaller, but seldom larger, than a drop of the real acid. Much or this slaughter was also witnessed (about eighteen months ago) at the police office of this city, by my friends John Reid, James Y. Simpson, and David Skae, as well as by various others. Never did we there see such a recovery take place as that which I have now described; and we remarked that it was only powerful animals that survived the administration of the poison more than a very few minutes.

Experiments similar to the above were made with creasote; and the results were almost identical with those observed when prussic acid was employed.[1]

In conducting this investigation, it was found essential to the success of the operation that the blood should be very speedily and copiously abstracted. This remark is equally applicable to the relief of the heart from air—that is, it must be done immediately and thoroughly. Nysten says, that he restored two dogs from a moribund condition, by forcing the air out of the heart, through an opening in the jugular vein, by means of pressure on the thorax. This is certainly a very clumsy mode of proceeding, and I should think, even in dogs, that it is not always likely to succeed. At all events, in the human subject such a method could be of little or no avail. The recommendation here given—which is also that of Magendie—is certainly that which the surgical operator ought if possible to follow when the untoward accidents occur of which frequent mention has already been made. Magendie recommends the air to be drawn from the heart by applying the mouth to the divided vessel, or by pumping it out with a syringe if that instrument should happen to be within reach.[1]

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[1] There are cases of blows on the head (as is stated by John Reid in the paper already quoted) in which the contractions of the heart are not renewed by unloading its right side. It must be borne in mind, however, that in this class of cases many anomalies present themselves, depending apparently, to a certain extent, upon the degree of shock sustained by the nervous system; but it is to be explained more fully, I think, by reference to a fact which must strike every one who performs experiments upon animals—that the persistence of the contractility of the heart in individuals belonging to the same species—and killed in exactly the same way—varies very much in duration.

It is evident that the surgeon ought not, even for a few seconds, to delay his attempts to relieve the heart; and consequently, in most cases, he will have recourse to sucking with his mouth, if he be anxious to proceed with the necessary expedition.

Though convinced of the advantage which results, in the majority of cases, from the removal of the air from the heart, I must admit that in a few instances my attempts to restore animals in this way proved abortive. This failure ought probably to be attributed to too large a quantity of air having been introduced, or to some other accidental circumstance producing a state beyond that of imminent danger from which it was possible to relieve the animal. In spite of these unsuccessful efforts at resuscitation, I can confidently state, as a fair deduction from experiments, that *in general*, the method recommended, if promptly had recourse to, and judiciously conducted, will prove successful.

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[1] MAGENDIE :—Leçons de la Vie, p. 60. Paris, 1836.

I think the experiment more generally succeeds when, along with the air, a considerable quantity of blood is evacuated. In support of this opinion, the following case is subjoined. When Bouley Junior, veterinary surgeon of Paris, was bleeding a horse for pneumonia, having ceased to compress the vein, he heard a peculiar sound, which, however, did not particularly attract his attention, as he had on former occasions remarked a similar occurrence. The operation was concluded, and the animal sent back to the stable, where it was immediately seized with general trembling. Respiration became laboured and plaintive, the pulse small, irregular, and very quick; and then, groaning deeply, it fell down as if struck by a thunderbolt. For some time Bouley was unable to account for these symptoms; but upon recollecting the sound which was heard when he relinquished his pressure of the vein, he concluded that it might be owing to the entrance of air. Under this impression, the vein was caused to bleed afresh. As the blood flowed, the animal revived: in half an hour after the accident, it was restored to the state in which it was prior to the operation; and in three days it was put to its usual work. Magendie states that an analogous case happened to Girard at the veterinary school of Alfort.[1]

The advantage which resulted from the loss of blood in Bouley's case is very obvious. May not recovery in the following surgical instance in the human subject be traced to a similar cause?

When Mr. Simmonds was removing a large tumour from

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[1] MAGENDIE :—Journal de Physiologie, tome i, p. 197.

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the left side of the neck of a woman in the Manchester Infirmary, in 1791, he divided the internal jugular vein. "The torrent of blood," he says, "pouring out from so large a cavity, and the noise occasioned by the rushing in of air, added to other appearances, formed a picture more frightful than I ever beheld." The patient recovered. As there is nothing said about the injurious consequences of the admission of air into the circulation, we may presume that none were apparent. It is merely stated, that the patient experienced no morbid affection of the head from the obliteration of the vessels.[1]

It naturally occurs, when reflecting upon the practical import of these cases, that advantage from the abstraction of blood from the divided vessel may be prevented, or that even increased danger may be incurred by hazarding, the admission of an additional quantity of air into the right auricle. If the vessel be gaping from disease of its coats, perhaps the safest plan would be to open the largest healthy vein in the neck which may be within reach: for from what has already been stated, the chance of saving the patient depends almost entirely upon the speedy and effectual unloading of the heart. Should the air have gained access merely from the temporary gaping of the vessel occasioned by the position of the patient during the operation, there can be no objection, not only to sucking the air out by it, but also to giving the additional relief to the heart which would be afforded by the derivation of blood and the contractions of the auricle.

If the state of the parts render it necessary immediately to apply pressure to the wounded vein, and should it be impossible or inexpedient to attempt relief by opening any of the great vessels near the heart, the. next best thing which can be done is to relieve the circulation by some less direct method, which may be readily accomplished either by venesection at the bend of the elbow or by opening the temporal artery. Dr. Warren, of Harvard University, has published a case in which there is every reason to believe that the patient was saved by the latter operation. When this gentleman was removing a cancerous tumour from the left side of the face and neck, in a case in which all the neighbouring tissues were involved in the disease, a very distinct sound was heard resembling the passage of air through water. The patient became faint, his countenance livid, his respiration stertorous; and convulsions were observed. The wounded vessel—a small vein running across the neck—through which the air had rushed, was immediately compressed, and the temporal artery opened, when the blood issued forth in abundance. During the first twenty minutes there was a very marked abatement of the alarming symptoms. He continued, however, in a state of insensibility for two hours and ten minutes longer, when he awoke as if from sleep. On the following morning he was in his usual state, with the exception of some soreness over the thorax and some headache. The operation was afterwards completed; and when the wound had nearly healed the patient was dismissed at his own request.[1] The time during which he remained in hospital after the accident is not stated; but it must have been considerable, since it appears that seven days intervened between the first and second operations.

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[1] Medical Facts and Observations, vol. viii, p. 23.

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[1] Medical Gazette, vol. xii, p. 269, where Dr. Warren's paper from the American Journal of Medical Science is given.

Artificial respiration, frictions, the application of stimuli to the nostrils, and especially the cold effusion, may in certain cases be used as subsidiary means; but they are certainly not entitled to that primary importance which is generally assigned to them by some who have written on this subject. Time ought not to be trifled away in blowing and rubbing:—the root of the evil ought at once to be laid siege to.

Warren has very strange notions regarding the treatment to be adopted. After recommending both the external and internal use of ammonia, dashing cold water on the face, the introduction of a tube into the glottis or through an aperture between the thyroid and cricoid cartilages for the purpose of carrying on artificial respiration, and so on, he proceeds to say:—"An attempt to pump the imbibed air from the heart from the internal jugular vein by means of a syringe is an operation that cannot be recommended, since it appears more likely to allow the entrance of a farther quantity of air than to abstract that already admitted." In reply to this, it is sufficient to say that the heart can be much more readily relieved by a method different from that which he condemns. He goes on to make a most extraordinary suggestion in the next sentence. He says:—"A proposal which might at first sight seem scarcely more plausible than that mentioned might be made with some hope of advantage. The introduction of a liquid into the veins has been often attended by the revival of the patient in cases of cholera, though rarely with ultimate success. In this accident, the vital powers not having received that lesion which is the result of an exhausting disease, it may be hoped that a successful revival might sometimes be effected by means of the injection of the saline solution into the veins."[1] There can be little doubt but that the injection of a fluid into the veins would increase and not diminish the danger. Be that as it may, it is not easy to discover the analogy between cases of cholera and the class of cases at present under consideration. Is a man writing in any work—but especially in awork to be extensively circulated among the junior members of the profession—justified in making such a recommendation without previously putting it to the test of experiment upon the inferior animals or without having any reasonable theory to adduce in its support?

The measures which the surgeon ought to adopt with a view of guarding against the admission of air during an operation are very obvious. When operating on parts extensively diseased, or when cutting in the vicinity of the large veins in the neck, he must pay special attention to the position of the patient; and when obliged to divide a large vein, he ought not to be unprepared for the entrance of air into the circulation. With a view of averting this danger, he ought, before making the hazardous incision, to request the patient to take a full inspiration, so that the vessel may be divided during expiration.

Should it happen, however, that in spite of every precaution, a dangerous quantity of air gain access, not an instant must be lost in adopting the measures formerly pointed out as the most likely to save the life of the patient.

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[1] Cyclopædia of Practical Medicine and Surgery, Article, AIR, p. 266. Philadelphia, 1834.

CHAPTER IV.

REMARKS UPON THE GENERATION OF AIR IN THE LIVING BODY, ESPECIALLY IN THE BLOOD-VESSELS; WITH OBSERVATIONS ON THE CONSEQUENCES WHICH MAY RESULT FROM ITS PRESENCE THERE.

PRETERNATURAL accumulations of air take place in almost every part of the body. They have been noticed in situations where air ought naturally to be found, as well as in those where it ought not to exist—in organs which communicate and in those which do not communicate with the external air. It is known to accumulate in the bladder—the uterus—the cavities of the pleura—peritoneum—pericardium—arachnoid—tunica vaginalis—in the cellular tissue all over the body—and in the parenchyma of organs. Dr. Brierre de Boismont, in his excellent Thesis on Pneumatoses,[1] mentions a case of gaseous matter being formed within the synovial membrane of the knee-joint, and from the analogy between synovial and serous membranes, it is curious that no similar case (as far as I can discover) should be on record. My friend Dr. James Duncan has however informed me of a case somewhat similar to that mentioned by Brierre de Boismont. It occurred in the practice of the late Dr. James C. Gregory, and under the observation of Dr. Duncan. The patient was a woman of thirty-six years of age. Her disease was cholera. In consequence of the injection of the saline solution, phlebitis supervened. During life it was suspected that within the cavity of both knee-joints there was accumulated a mixture of air and pus, and upon dissection a few hours after death, such was proved to be the case. In this instance, however, it is probable that the gaseous matter was produced by the decomposition of the pus.

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[1] BRIERRE DE BOISMONT:—Recherches sur les Pneumatoses. Thèse de Paris, 1825, p. 24.

In many animals air is an ordinary and natural secretion. Such is the gaseous matter contained in the swimming bladder of the fish; but what is more to our purpose, in many of the cold-blooded animals air appears to circulate along with the blood. Reichel frequently observed globules of air in the blood of frogs;[1] and Spallanzani saw the same in that of salamanders.[2] Blumenbach states that he has seen air vesicles so frequently in the blood of amphibia and fishes, that he considers them to be constantly present.[3] Similar observations have been made by Redi, Caldesi, and Morgagni.[4]

Abnormal formations of air are by no means uncommon, both in the inferior animals and in the human subject, in certain states of disease; and they sometimes exist without any other morbid phenomena being apparent. Bags containing air have been found in the abdominal cavities of healthy pigs. Occasionally air is contained in cysts in the human subject.[1]

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[1] REICHEL:—De Sanguinis motu experimenta, p. 16. Leipsic, 1767.

[2] SPALLANZANI:—Expériences sur la Circulation, &c., p. 158.

[3] BLUMENBACH:—Kleine Schriften zur Vergleich. Phys. und Anat. und Naturgesch. gehörig, parag. 71.

[4] MORGAGNI:—De Sedibus et Causis Morborum, lib. i, 2, p. v, § 22

In hysteria, air frequently accumulates in very large quantities in the stomach and intestines; and in peritonitis the formation of gaseous matter is a common occurrence. Air may accumulate in the urinary bladder, the uterus, and in other situations, without indicating a state of general disease; and may be consequently of trifling importance. The distension of the uterus with air, however, has occasionally given rise to awkward errors, from the affection being mistaken for pregnancy. I was lately informed by a medical friend of a woman residing near Edinburgh, to whom such a misfortune happened. The baby clothes were ready, and she was in the daily expectation of being brought to bed. One morning, however, having stooped to pick up something from the floor, to her no small astonishment and dismay the contents of the uterus passed off in one continued stream of air.[2]

Sudden impressions made upon the mind occasionally produce an immediate disengagement of a large quantity of air. Frank mentions the case of a lady, who on hearing a false report of the death of her husband, fainted, was seized with convulsions, and at the same time became enormously tympanitic. Lobstein, in quoting this case, gives another of the same kind. A man, after a hearty meal, received a piece of bad news. Suddenly his digestion became disordered, and air was formed within his body to so great an extent as actually to suffocate him.[1] Hypochondriacs are very subject to the formation of large quantities of gaseous matter within the stomach and intestines.

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[1] Dictionnaire de Médecine :—Article, KYSTES.

[2] An analogous case is related in the Lancet, vol. ii, p. 355. BIANCHI has recorded a similar case in the Journal de Médecine de Paris, 1756. Vide also ASTRUC, Traité des Maladies des Femmes.

Spontaneous emphysema has often been observed to a greater or less extent as a sequel of certain epidemics. We are told by Frank that an epidemic fever which prevailed in Germany in 1772, and another which raged in Bobbio (a small town in Italy) in 1789, frequently terminated in a general emphysema. The same author mentions the case of a young lady of Vienna, who used to become emphysematous during every paroxysm of a tertian ague.[2]

Dr. Sickel gives an account of a woman, who, without any external injury, was suddenly seized with emphysema over the whole body. No bad consequences resulted; and on the following day the affection had completely disappeared.[3] The narrator assigns, as the cause of the phenomenon the fact that a short time before its occurrence the woman had eaten some mustard seed, eruca, and a sausage.

It has been stated by Baillie, and other observers, that when air is found in the stomach or intestines of a dead animal, it may generally be also detected in the small blood-vessels of these parts. Baillie, after detailing a case of "emphysema not proceeding from any local injury," gives it as his opinion, "that the air was formed from the blood itself, by some peculiar arrangement of its parts, and conducted into the cells of the cellular membrane by very small vessels."[4]

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[1] LOBSTEIN:—Traité d'Anatomie Pathologique, tome i, p. 156. Paris, 1829.

[2] Cyclopædia of Practical Medicine—Article, EMPHYSEMA.

[3] Sicelii Decad., *quart.*, 1744, p. 487.

[4] BAILLIE:—Transactions of a Society for the Improvement of Medical Knowledge, vol. i, p. 202.

Andral[1] and other eminent pathological authors speak of gaseous matter being formed in the circulatory apparatus. Lobstein also regards this as an established fact; and he considers gaseous secretions, in whatever part of the body they may be found, as *vital products*, resulting from some peculiar nervous influence, engendered in the minute ramifications of the nerves embracing the capillaries;[2] and Gaspard employs the term "*gazeification vitale*" in his essay on the subject.[3] The experiments of Magendie and Girardin clearly show that the gas secreted by the intestines is not the result of any chemical decomposition, but is truly a vital secretion. After many careful observations, they found that the nature of the ailment did not influence the nature of the gases which were produced:—the gases were invariably the same. In the smaller intestines the gases detected were carbonic acid, hydrogen, and nitrogen; and in the lower bowels were found the same gases with the addition of sulphuretted hydrogen.[4] From all these considerations, then, it seems manifest, that although in many cases, accumulations of gas within the body owe their origin to chemical decomposition, yet nevertheless they are sometimes the products of a vital action.

Whatever be the explanation of the fact, it is quite certain that emphysema frequently takes place without any lesion; and that in such cases upon dissection air is found in the blood-vessels.

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[1] ANDRAL:—Précis d'Anatomie Pathologique, tome i, p. 523. Paris, 1829.

[2] LOBSTEIN:—Op. cit., tome i, p. 162.

[3] GASPARD:—Dissertation Physiologique sur la Gazeification Vitale. Paris, 1812.

[4] Recherches Physiologiques sur les Gas Intestinaux, § 8. Paris, 1814.

Some curious instances have been recorded, in which there seems at least a very strong probability that during life a very large quantity of air was contained in the blood-vessels. A man twenty-five years of age, who had been ill for fifteen days, was admitted into the Hôpital Cochin of Paris, "with symptoms of typhoid fever; he also complained of pain in the left thigh. Whilst he was in a state of delirium, he said that he had been bitten on the knee by a dog. The limb was most attentively examined, but not the slightest trace of such an accident could be discovered. The thigh and scrotum were much swollen. He died on the following day. On dissection, eight hours after death, the surface of the body was found soiled by blood which had transuded through the integuments, and some blood had also been discharged from the nose. The whole body was emphysematous, but the left inferior extremity was so to a very high degree. It was double its natural size, of a brown colour, and covered with numerous phlyctenæ, some black, of great extent, and collected in clusters, from which escaped a reddish serous fluid, mingled with a quantity of gas: others were white, from which nothing but gas escaped. When the limb was pressed with the hand, crepitation was distinctly heard: the abdomen was much distended with gas: and in the intestines there existed the characteristic alterations generally found in cases of typhus fever. Bubbles of air filled the vessels of the pia mater and the left vena saphena. The lymphatic ganglions of the mesentery were enlarged, and contained gas, which took fire from the flame of a taper and produced an explosion; the same phenomena also followed the exit of the gas from the legs, thighs, and scrotum."[1]

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[1] London Medical and Physical Journal, for June, 1831, as quoted in Article EMPHYSEMA in Cyclopædia of Practical Medicine.

Weber mentions a case of aneurism containing air.[1]

According to the experiments of Krimer it appears, that if the blood be pressed out of a portion of an artery, and that portion be isolated by two ligatures, it will soon become distended with air.[2] This statement, if correct, favours the opinion that the internal coat of an artery has the power of secreting air.

We are inclined to believe that such is the case. The following is a summary of the facts upon which this opinion is founded. Air is found circulating in the vessels along with the blood in certain cold-blooded animals. Air has been found unmixed with the blood in the human species after death, when from the history of the case there is every reason to suppose that it was in the blood-vessels during life. Air is secreted by serous membranes, to which the inner coat of an artery bears a close resemblance; and this, when viewed in connection with the experiments of Krimer, is an argument of considerable weight.[3] Another argument might be drawn from cases of sudden death in which the only thing found to explain the event was the presence of a large quantity of air in the blood-vessels. Sometimes the gaseous matter is found only in the vessels of the brain. To this class of cases Morgagni has given the name of *gaseous apoplexy*. At other times, the heart is distended with frothy blood.

From what has been stated, it is fair to entertain the idea, that the sudden evolution of air within the blood-vessels may occasionally give rise to symptoms similar to those produced by its injection into the veins. This hypothesis is strengthened by the fact, that the formation of air in the living body sometimes takes place with extreme rapidity.

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[1] WEBER:—Annotationes Anat. et Phys., p. 6.

[2] KRIMER:—Versuch einer Physiol. des Bluts, § 177, 185. Leipsic, 1823.

[3] In BURDACH, vol. v, p. 209, is the absurd fancy that air is naturally secreted in the heart and origin of the large vessels, because they empty themselves of their blood without being able to remain collapsed.

Cases of sudden death, in which the heart is described as having been found distended with air, are not so numerous as those in which the air has been found only in the vessels of the brain. A very remarkable instance is given by Morgagni. "A fisherman of Venice, upwards of forty years of age, and the subject of dyspepsia, was seized when in his boat with an affection of the abdomen, caused apparently by flatulence, to which he had been previously liable: he suddenly expired." "The body was examined on the following day. The abdomen was tumid from gas, with which the stomach and intestines were inflated." "The heart was large and flaccid; and both of the ventricles, and the right auricle, contained frothy blood." Most of the veins, the pulmonary artery, the aorta and carotids, also contained a frothy mixture of air and blood. The scrotum was greatly inflated with air.[1] Pechlin gives a case of a somewhat similar nature,[2] upon which Nysten remarks—"On reconnoit que la mort doit être spécialement rapportée à la distension du ventricle pulmonaire par un gaz qui empêchoit le sang veineux d'y arriver." Unfortunately the symptoms which immediately preceded death are not detailed. Ruysch[3] gives an account of a woman who died suddenly, and in whom the heart was found distended with air.[4] A similar case is described by Grætz, and is quoted by Morgagni (lib. i, ep. v, § 20) and Nysten (p. 7, and p. 174).

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[1] Morgagni, by Cooke:—Vol. i, p. 80. London, 1822.

[2] Pechlin:—Observ. Physico-Medicæ. Obs. lvii, p. 135. Hamburgh, 1691.

[3] Ruysch:—Opera Omnia, 1737, p. 9.

[4] Mr. Percivall, veterinary surgeon in the 1st Life Guards, has published an account of a horse which died suddenly when under treatment for a catarrhal affection, the heart of which, upon dissection, was

The following are perhaps two of the most important cases of this kind which have been recorded.

The one is given by Nysten upon the authority of his friend Dr. De Jaer. The subject of the observation was a shoemaker of forty-five years of age, who had for the last fifteen years of his life been afflicted with spasmodic asthma, and had generally about seven violent attacks during the year, which came on without any premonitory symptoms. At the commencement of one of the attacks, he was brought to the Hôpital Cochin of Paris, where he died on the third day. The body was opened twelve hours after death when it was yet warm. The left ventricle and the arteries contained no blood; but the right auricle and ventricle, and the whole venous system were distended with frothy blood. All the organs were in their natural state, and the muscles were very firm and red. The shortness of the time allowed to elapse between death and dissection gives additional importance to this case.

The other case occurred to M. Laumonier, in the hospital of Rouen.—A woman, aged fifty-six, died suddenly from an attack of asthma, a disease to which she was subject. The body was examined twenty-four hours after death. The season was winter; and there was not the slightest trace of putrefaction. There was emphysema in various parts of the body. The internal coat of the carotid artery had a red appearance, as if resulting from inflammation. The heart was very much distended; and its right cavities were filled with gaseous matter of a peculiar smell.

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found enormously distended with air. (Veterinarian, vol. x, p. 65. London, Feb., 1837.) It is exceedingly to be regretted that there is no mention made of the time which elapsed between death and dissection.

In the Medical Observations and Inquiries there is a singular case mentioned, which I am somewhat inclined to classify with the above. The patient during life was sensible of a noise within the thorax resembling "a stream of water passing over obstructions, or passing over a narrow confined place. He was subject to exacerbations, and when he varied his position the circulation became confused, and as it were wholly carried on in a corner of his heart, which at such times beat with a whizzing noise. During his illness he felt the greatest pain when the noise seemed least; so that when speaking of his situation he had a common expression that *Gush was his friend;* while Gush stood by him he should live."—At last he died. Upon dissection the pericardium was found loaded with fat. The heart *in situ* was longer and more pointed than usual for its size. The right auricle was much enlarged, and very thin, bearing strong marks of inflammation. The ventricle having lost its usual firmness and colour, was so transparent, as in a manner to admit an inspection into its very substance. *Upon cutting into these two cavities a considerable quantity of air rushed out, and upon laying them both open they appeared as totally void of blood as if they had been washed clean. The interstices between the chordæ tendineæ were full of air bubbles.* A variety of less remarkable morbid appearances were noticed. Unfortunately it is not stated at what period after death the inspection was made, so that the case standing, as I believe it at present does, *per se*, is deprived of much of its value.[1]

Without laying any weight whatever upon this last case, it does not seem too hypothetical to suggest that in the cases which occurred in the Hôpital Cochin and the Hospital at Rouen, the immediate cause of death was the presence of a large quantity of gaseous matter in the heart.

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[1] CHESTON (R. B.) Surgeon at Gloucester:—Case of M. Houlder; Communicated by Dr. William Hunter to Medical Observations and Enquiries. Vol. vi.

Violent mental emotions sometimes occasion the disengagement of large quantities of air. Is it possible that the rapid evolution of this elastic fluid is the immediate cause of any of those instantaneous deaths which frequently follow sudden and immoderate emotions of joy or grief?

Death it would appear sometimes takes place from the sudden disengagement of gas within the vessels of the brain, constituting the *gaseous apoplexy* of Morgagni and other authors; but a mere reference to this subject must suffice, as the appropriate limits of a Thesis have I fear been already exceeded. The idea of Morgagni was, that the cause of death was the pressure exerted upon the brain by the air; but Bichat thought that in some cases the quantity of air found is so small as not to give plausibility to this explanation, and contended that the life of the brain was destroyed by some peculiar and subtle action exerted upon it.[1]

All that can be said with confidence, in reference to this branch of the subject of air in the organs of circulation is, that there are various facts and arguments which render it exceedingly probable, that the sudden formation of air within the blood-vessels, may cause death either by arresting the contractions of the right side of the heart, or by producing a direct fatal action on the brain.

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[1] MORGAGNI:—Sur la Vie et la Mort, Part ii, Article 2de, § 2.

REMARKS

ON

A CASE OF SUICIDE,

PUBLISHED BY

DR. P. D. HANDYSIDE,

In No. CXXXIV of the Edinburgh Medical and Surgical Journal;

INTENDED TO SHOW THAT HE HAS ERRONEOUSLY ASCRIBED THE CAUSE OF DEATH TO

Air in the Organs of Circulation,

WITH SOME STRICTURES UPON THE THEORETICAL DOCTRINES ADVOCATED IN HIS MEMOIR.

(*Read before the Royal Medical Society of Edinburgh, 23rd March,* 1838.)

[*Reprinted from Pamphlet published by John Carfrae & Son, Edinburgh,* 1838.]

PREFACE.

The following remarks are printed almost *verbatim*, as they were read before the Royal Medical Society at its last meeting. I do not think that any of my objections were answered on that occasion; but as Dr. Handyside then stated his willingness to reply in the event of my paper being published, and expressed a desire to have such an opportunity afforded, it is now submitted to the public.

My sole object in bringing this communication before the Medical Society was the elucidation of truth, and the correction of what appeared to me to be errors of a dangerous nature—not merely as affecting the soundness of physiological opinions, but as connected in an essential manner with a point of much importance in Medical Jurisprudence.

I have first pointed out that there is no evidence that in this case the air found in the vessels was the cause of death, and have afterwards shown that, although we are not entitled to pronounce with absolute certainty upon this question, there is very great reason to believe that hæmorrhage was the immediate occasion of the fatal result. The remarks which follow, on the theoretical views of Dr. Handyside, are intended to point out the untenable nature of his peculiar opinions, and not as a vindication of my own views; for these I have already published in sufficient detail.

EDINBURGH: 2, LONDON STREET,
March 26, 1838.

REMARKS

ON

DR. HANDYSIDE'S CASE OF SUICIDE.

Dr. Handyside has, in the last number of the Edinburgh Medical and Surgical Journal, published an account of a case of suicide, in which he states that death was caused by the entrance of air into the vessels divided by the incisions which the unfortunate man inflicted upon his neck; and the same opinion is held by Mr. Watson who mentions the case in his Treatise on Homicide. I was also under the impression that this was the cause of the fatal catastrophe when my Thesis on the presence of Air in the Organs of Circulation was published; and in consequence, it was there briefly noticed.[1]

This, however, arose entirely from some essential errors in my information: and the account given by Mr. Watson, though said to have been furnished by Dr. Handyside, contains the very mistakes which misled me, and differs in the most material points from the narrative given in the Journal, a perusal of which convinced me that there was not the slightest ground for attributing death to the air found in the blood-vessels.

Dr. Handyside informs us, that "on opening the pericardium, *the cavities of the heart were found collapsed,*[1] *and nearly empty.* The right auricle was perfectly empty of blood, with the exception of a minute coagulum at the foramen ovale. This cavity contained some atmospheric air." (p. 211.) The coronary, femoral, popliteal, and other arteries, as well as various veins in different parts of the body, when "placed under the surface of water, gave vent on being opened to several globules of air," (p. 212.) In the concluding remarks, when speaking of the medico-legal bearings of the case, it is stated that "*the heart was perfectly empty of blood, and contained air alone* ;" but there is no hint thrown out as to the possibility of something else than the air found in the vessels having occasioned death ; although it is stated in the next clause, that other cases of death from this cause "have generally presented in this organ commixed with the air some blood either in a fluid or else in a frothy state," (p. 220.)

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[1] Prize Thesis on Air in the Organs of Circulation, p. 35, Edin. 1837. [See also p. 43 of this volume of Clinical Studies.]

Nysten, who has made a number of most careful experiments on this subject, observes, that when death is the speedy consequence of the entrance of air into the organs of circulation, *the right auricle is always found distended with frothy blood.* Amussat in a report upon the introduction of air into the veins, which he lately read to the Royal Academy of Medicine at Paris, mentions that he killed many animals by allowing air to enter the veins spontaneously;—and in reference to the state of the heart, he speaks in the following very decided language— "*On trouve constamment les cavités droites du cœur distendues.*"[1]

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[1] A few lines further on we are told that "the left cavities of the heart were found perfectly empty of blood, but *in a state of partial distension, like the other cavities of this organ from the presence of air.*" How could the cavities of the heart be both "collapsed," and in "a state of partial distension ?" In Mr. Watson's work it is stated that the heart and large vessels were "*moderately distended, but contained very little blood, and that in a frothy state,*" p. 109.

There can be no doubt of the correctness of the statements of Nysten, Amussat, and many other experimenters, to the effect, that the distension of the right side of the heart is a constant occurrence.

With regard to the frothy appearance presented by the blood, it may be well to remark, that if the right auricle be very rapidly distended to such an extent as instantaneously to arrest its contractions, the blood and air are found unmixed; but this is a result which can only be obtained when a wide tube is used, and great force is employed in the introduction of the air. The fact, however, connected with the frothing of the blood, which it is of essential importance for us to bear in mind at present, is this:—*When an animal is speedily killed by the introduction of air, and bubbles of this fluid are found in the vessels, the right side of the heart is always distended with* FROTHY *blood.* Of the correctness of this statement I am perfectly satisfied from the results of my numerous experiments; and it is an opinion amply corroborated by experiments previously performed by Nysten, Magendie, and many others.

In some of the cases published as instances of death from air entering the veins, there is no mention made of the distension of the right side of the heart—nay, we are occasionally told that the heart was empty. But surely these cases cannot be brought forward in opposition to the unvarying results of numerous experiments performed in different parts of the world.[2] They must either have been erroneously included in this class of cases, or the accounts with which we are furnished, must be very inaccurate: or, possibly owing to the slovenly manner in which the examination was made, the air was allowed to escape from the heart. Velpeau has recently given an abstract of all the published cases of sudden death ascribed to the entrance of air into the veins, and many of these narratives he considers as furnishing no evidence of the real cause of death. Other cases, from his statements, appear to have been published on vague hearsay evidence, and are essentially fictitious. In the long and interesting debate which followed the reading of M. Amussat's Report, M. Gerdy stated his conviction that a good many instances of sudden death have been erroneously ascribed to the entrance of air. From the foregoing statements we cannot doubt that the narrator of the case of suicide at present under consideration has committtted a similar error. The facts already adduced seem so complete and conclusive, that it is unnecessary to enter upon the discussion of some minor topics from which collateral evidence might be derived. It is maintained then, that the simple circumstance of *the heart being found collapsed and destitute of frothy blood, of itself affords sufficient proof that Mr. Doherty's death has been erroneously attributed to the air found in the blood-vessels after death.*

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[1] Archives Générales de Médecine, Jan., 1838, p. 115.

[2] M. Barthélemy has stated that in some instances in w

It is no very unusual thing in post-mortem examinations

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experiments were performed on horses, he did not find the heart unnaturally distended with blood; but as M. Barthélemy has not alluded to an obvious source of fallacy, viz. the division of the large vessels at the root of the neck in laying open the chest, I suspect it was not in these cases provided against. I have ascertained that when any of these vessels are divided, the distended heart becomes rapidly collapsed.

to find air in the heart and vessels. At the *sectio* of a fever patient who died suddenly in convulsions in one of Dr. Alison's wards in the Royal Infirmary, examined thirty hours after death during the late intense frost, I observed air mixed up with blood in the heart. The inferior vena cava was enormously distended with fluid and frothy blood. Unfortunately from the relations of the deceased hurrying the dissection, there was not time to examine the other vessels. I have collected many analogous cases in the fourth chapter of my Thesis. In some of them in which the right side of the heart was distended with frothy blood, and the patients died suddenly, it was suggested that the air spontaneously generated might be the cause of death.

In the case of Mr. Doherty, from the number of vessels divided, and the short period during which he lived after inflicting the wounds, a considerable quantity of air must have entered the organs of circulation after death—indeed after the arrival of Dr. Handyside—for he stated in the Society, that when he came, the body was lying with the face on the floor, and the vessels so compressed by the adjoining parts as to prevent the entrance of air. Had it been stated that there was no air found in the vessels, the assertion would not have been credited by any physiologist, because, as is well known, Dr. Parry has proved, that the arteries, soon after death, in virtue of a peculiar property with which they are endowed, contract, and after a time regain their former calibre. Now, it is obvious, that in this way a vacuum must be formed; and if there be an opening, the atmospheric air will, in accordance with a well known physical law, immediately rush in when this dilatation takes place. As there were many arteries divided in the case of Mr.

Doherty, it is, I think, clear that through these apertures a good deal of air must have gained admission after death.

There are various ways of accounting for the presence of the air found in the vessels of Mr. Doherty, and were not the subject somewhat irrelevant to the point at issue, it would be interesting to enter more into detail; but, since it matters not to the argument whether the air entered during life or after death, I refrain. I have injected a quantity of air into the veins of rabbits, without producing death; and then in the course of one or two hours have killed the animals, (which had by that time quite recovered from the effects of the experiment, and were eating or running about the room,) when I found a greater or less quantity of minute globules of air, in the vessels over the whole body. When the rabbits were not killed till after the lapse of some days, the air was found to have disappeared. It is maintained, then, that the mere presence of air in the vessels is no evidence of its having occasioned death. The only proof of this is the distension of the right side of the heart with frothy blood.

There is no account given of the examination of the head, and Dr. Handyside stated in the Society, that none was made. This is very curious, because he grounds an hypothesis upon the state of the vessels of the brain, which nevertheless he was contented to leave unexplored. This is much to be regretted, for the omission renders reasoning upon some points of the case, to a certain extent, unsatisfactory. Nevertheless, let us now endeavour to discover what really was the cause of Mr. Doherty's death. From the small quantity of blood which, as appears from the narrative, was found in the body—from the heart being empty of blood, and all the large vessels nearly so, and also from the paleness of all the organs—we are naturally led to believe that the quantity of blood lost is far under-estimated when stated to have been not more than a pound and a half. It is worth noting that the blood was on a carpet, a circumstance apt to lead to an under-estimate, as a good deal must have been absorbed, and consequently was not apparent to the eye. However, admitting that the hæmorrhage was to no greater extent than this, it was, I think, in the circumstances of the case, quite sufficient to cause death.

In the first place, it is important to bear in mind, that the blood was rapidly poured out from a number of vessels, simultaneously, or almost simultaneously, divided. Of the rapidity of the effusion there can be no doubt, for Dr. Handyside tells us, that when he arrived ten minutes after the incisions had been made, the blood "lay partially coagulated upon three different parts of the floor of the apartment." Now, all writers on physiology state, that a small quantity of blood suddenly lost may induce fatal syncope; and every one in the habit of performing venesection must have been struck with the remarkable difference which exists between patients, in the amount of blood which they can lose before fainting takes place. When the body of the Princess Charlotte, who died of uterine hæmorrhagia, was examined, *only twenty ounces of blood* were found in the uterus.

A woman, says M. Velpeau, was bled in the arm; "but eight ounces of blood had hardly flowed, when the patient uttered a plaintive cry and died! Nothing was found upon post-mortem examination." What can we say of a case like this? "If death was not caused in this instance by the entrance of air into the veins," exclaims M. Maugeis, "what could have caused it?" Were I in that practitioner's place, my answer would be an easy one. I should content myself with saying, "*I know nothing about it.*"[1]

But there is a circumstance connected with the case of Mr. Doherty which ought not to have been omitted in the memoir. It was known to the landlady and many acquaintances of the deceased; and as the investigation was a judicial one, I should think also to Dr. Handyside. *Mr. Doherty had for some days been labouring under delirium tremens*, a disease in which, as is well known, the vital powers are easily depressed. Every one is acquainted with the very small loss of blood which patients so affected are able to bear. When talking the other day of this subject to my friend Dr. James Duncan, he mentioned a case quite in point, which came under his own observation. A man with delirium tremens was bled—less than a pound of blood was taken—he died in five minutes afterwards. When we consider, then, that Mr. Doherty was afflicted with this disease at the time he committed suicide, there is nothing improbable in the supposition, that a pound and a half of blood suddenly poured out from a wound which divided many large vessels in the neck, was the immediate cause of his death.

It still remains for us to notice that part of the memoir in which the general question as to *how air when admitted into the veins causes death*, is discussed. "In tracing," says the author, "the *modus operandi* of the presence of air in the veins producing the foregoing train of symptoms and effects, although I may premise that we know with certainty but little, yet we are justified in assenting to the well-founded general belief, strongly maintained by Nysten and Magendie, and supported by the late Sir John Leslie, that when the cavities of the heart become suddenly and violently distended with air, this organ cannot freely exercise its functions, and encounters much difficulty in contracting on such a powerful and elastic resistance. It cannot, however, be granted, that death is produced by the heart being prevented from propelling the blood which it contains into the lungs, as Nysten argues, for both the blood and the air, we have seen, are propelled; and in cases where, from the quantity of air that has entered, a fatal result has ensued, not only has the heart been found empty, but the pulmonary vessels and the arteries of the system have at all parts contained air." Here we have an assertion; but as neither the opinions of authors, nor original experiments are cited in its defence, it must go for nothing; and there is not one experimenter whose name Dr. Handyside has mentioned that does not give an opinion directly opposite; for, as has already been stated, all experimenters agree in maintaining that the heart is not only never found empty but is always observed to be distended.

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[1] VELPEAU:—As translated in *Medical Gazette*, 17th March, 1838, p. 958.

The next opinion canvassed, is one which we are informed is "*a common idea*," viz., "that the stoppage of the heart's action is occasioned by a loss of its contractile power from *overaction*;" and an experiment of my own is adduced to controvert this doctrine—a doctrine which most assuredly is not common; for though I have carefully examined the literature of the subject, I never discovered that such an opinion was held by any one. Judging from the identity of Dr. Handyside's references with those which I had previously given in my Thesis, his researches do not appear to have been more extended than my own, so that the refutation of this "*common idea*" is nothing more than a combat with a man of straw.

Dr. Handyside's own views now come to be developed; and a theory is propounded, which in some points certainly lays claim to novelty, but is upon the whole only a modification of that long ago adopted by Bichat. As the details are somewhat involved and complicated, to prevent any misconception Dr. Handyside's own words are subjoined.

"It might," he says "probably be urged with greater propriety by those who seek to realize the old maxim, *cor primum vivens*, *ultimum moriens*, that the complete stoppage of the sanguiferous supply to the texture of the heart along the coronary arteries is the real cause of death, seeing that Sir Astley Cooper's recent experiments go to prove that the withdrawal even for a minute and a half of the supply of blood to the *mesocephalon* and the spinal marrow, above the origin of the phrenic nerve, by compression of the vertebral and carotid arteries, is fatal. The notion must be allowed to be fair and reasonable, that the function of the heart may be similarly arrested by the withdrawal, differently effected, of the sanguiferous supply to its texture."

How such a notion can be "fair and reasonable," is difficult to understand; for as every one knows, the contractions of the heart go on for some time after the withdrawal of the sanguiferous supply from its texture—they go on for a period much longer than that which elapses between the introduction of air into a vein and the death of the animal experimented upon. But who is ignorant of the fact, that after the heart is cut out of an animal, and the coronary arteries consequently become *filled with air*, the muscular contractions of the organ are frequently seen to go on for a considerable space of time?

To proceed, however, with the quotation:—"Yet, being aware," says Dr. Handyside, "that this temporary failure of the circulation is not adequate to explain the circumstance of the rapidity of death being always in the exact ratio of the suddenness and violence with which the heart is distended with air (as the considerations already offered respecting the suspension of the heart's action may have served to show) we are constrained to look more narrowly into the probable cause of death, and inquire, if, in such a case, the encephalon and spinal chord receive any supply of blood at all: and now finding that impossible, and next comparing the phenomena which supervened on the admission of air, with those symptoms and results which characterise several abnormal states wherein a similar derivation of blood from the head occurs, we accordingly at once recognise the analogy, and may thence be led to adopt, as, at least, probable, such a view of the cause of death, as follows."

"The cessation of the heart's action must operate injuriously, first, on the maintenance of the function in those organs which require an unceasing and unintermitted supply of blood. As the encephalon receives about an eighth of the blood of the entire body, the prejudicial effects of a very slight want of balance in the proper amount of which are so frequently presented to our view in the phenomena of syncope, and as the encephalon, and that part of the spinal cord, so essential to circulation and respiration, above the origin of the phrenic nerve, are supplied with blood almost exclusively, along the vertebral and carotid arteries; it is easy to understand how these parts of the nervous system are, by the distension of their vessels with an elastic fluid, wholly deprived of their supply of blood. And if the heart's action at the same time be not maintained sufficiently long, first, to circulate all the air it contains, and then to recommence the discharge of its appropriate fluid—a result equivalent to the complete division by the knife of that essential part of the nervous system must follow—namely, the instantaneous cessation of all the automatic movements of the system."

"This view seems the more probable, from considering the interesting experiments already adverted to, and which I had recently the favour of witnessing Sir Astley Cooper perform. In all these experiments the manual compression for the period of a minute and a half of the vertebral and carotid arteries in rabbits, was followed by death, preceded always by violent convulsions, similar exactly to those which have been observed to occur on depriving the parts of the cerebro-spinal axis, on which these vessels ramify, of their supply of blood through means of the admission of air, either casually on the operating table, or intentionally in experiments on animals." (Pp. 217, 218, 219.) This is certainly reasoning in a circle.

From what has now been quoted, it appears, that Dr. Handyside has entirely mistaken the nature and object of Sir Astley Cooper's experiments; for he merely states that "they go to prove that the withdrawal even for a minute and a half of the supply of blood to the mesocephalon and the spinal marrow, above the origin of the phrenic nerve, by compression of the vertebral and carotid arteries, is fatal!" This required no proof. The object Sir Astley had in view, was to determine the order in which the vital functions were arrested, and it is from their elucidating this point that so much interest attaches to them. He found that *respiration was at once arrested, and that the animals died almost without a struggle*[1]—not, as Dr. Handyside represents the case, in "*violent convulsions.*" Now, when a large quantity of air is thrown into a vein, the phenomena observed are very different. Desperate attempts at respiration are immediately manifested, and death is very speedily ushered in by terrible convulsions.

Thus we perceive that there is no analogy between the effects produced by the introduction of air into a vein, and the withdrawal of the supply of blood from the mesocephalon and spinal marrow above the origin of the phrenic nerve :—and if no such analogy can be drawn, it necessarily follows that Dr. Handyside's hypothesis has no foundation to rest upon. Therefore, in preference to it, and every other doctrine on the subject, I must still maintain that which is held by Nysten, Magendie, &c., &c., and now, I believe, by every one who has, with sufficient care, experimentally investigated the subject, viz. that the inability of the pulmonic side of the heart to contract, in consequence of its distension with frothy blood, is the cause of death when death is the immediate result of the introduction of air into the veins.

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[1] Cooper (Astley) :—Guy's Hospital Reports, No. III, Sept., 1836.

CASE OF DEATH

FROM THE

ENTRANCE OF AIR

BY A

RIGID VEIN IN THE NECK

OPENED ACCIDENTALLY BY A
SETON-NEEDLE.

[*From 'London Journal of Medicine' for October*, 1850.]

CASE OF DEATH FROM THE ENTRANCE OF AIR BY A VEIN IN THE NECK.

I WATCHED the various phenomena which presented themselves in the following case with intense interest; for if the accident had been a planned experiment, it could not have been more instructive in respect to physiology, pathology, and treatment.

CASE. — *Entrance of Air by a rigid Vein in the Neck, opened accidentally by a seton-needle. Asphyxia, and convulsions: death in seven hours. Distension with air of the right side of the heart found on dissection.*

William Richards, aged 39, labouring under chronic laryngitis, applied to Dr. R. Willis, of Barnes, for advice, in the spring of 1848. He was first treated by leeches, then by blisters; and lastly it was resolved to introduce a seton, as Dr. Willis had found this, in other cases, a completely successful method.

On the 25th March, 1850, the deceased came to Dr. Willis about 9 A.M. Dr. Willis set him in a chair, instructing him as to the proper attitude. He threw back his head, which, by keeping the parts tense, he being much emaciated, was inconvenient. Dr. Willis, having desired him not to do this, pinched up the skin with the finger and thumb of the left hand, and immediately thrust in a seton-needle, about the size of a common bleeding-lancet, armed with a strip of lint. It entered horizontally, about two inches and a half above the breast-bone, and not at all near any important blood-vessel. What followed was thus related by Dr. Willis at the Coroner's Inquest.—"At the instant of the entrance of the seton-needle, I heard a slight momentary hissing sound. At first I thought I had opened a subcutaneous abscess communicating with the windpipe; but, almost at the same moment, I looked in the poor man's face, and saw that another and far more serious event had occurred—that the rushing of the air was not from the windpipe, but into some small vein which had been implicated in the operation. The man was deadly pale; his features were set; he fainted; and subsequently he became rigid and convulsed. I kept my fingers on the openings, to arrest the further entrance of air during inspiration: I caught the man, and laid him down on the floor." It was in these circumstances that Dr. Willis sent for me; and in half an hour I was with him. The muscles were then rigid, and momentarily convulsed. The man seemed as if in an agony for breath: the muscles of respiration were in a state of frightfully violent, and somewhat spasmodic and intermitting action. The sound of air and fluid being, as it were, churned in the heart, was heard with, and also without the stethoscope. Dr. Willis and I entirely agreed as to the nature of the accident; and we were also of opinion that it was our first duty to relieve the oppressed lungs and over-distended heart by bloodletting, and then to use such stimuli, internally and externally, as the progress of the case might warrant or suggest. We hoped that in this way the rapidly increasing congestion of the lungs, and therefore impending asphyxia, might be averted. We judged it dangerous to open the jugular vein, because we feared that, during the deep and violent inspirations, more air might be drawn down into the heart, as, from the rigid state of the fascia of the neck, it was evident that the tube —the rigid vein—might be kept gaping and patulous. If we had had any one to aid us, we would have freely opened the jugular vein, and, by mouth-suction at the wound, relieved the right side of the heart. In the circumstances, it was determined to open a vein at the elbow: and, in three or four minutes after my arrival, I performed this operation. Before the bleeding, the patient was almost pulseless; but after it the pulse immediately revived, and the ammonia and brandy, which had previously produced no benefit, caused, when now repeated, a manifest improvement in the pulse and respiration; and the action of the diaphragm became less convulsive. Death, which before the bleeding had seemed to be momentarily impending, was certainly delayed, for a time, by the measures which we adopted.

We now sent to London for Mr. Syme, who was with us about noon. He found us applying, at intervals, warmth to the feet, dashing cold water on the face, and giving stimulants. The patient was in a more hopeful state as Mr. Syme entered than he had yet been. Mr. Syme entirely concurred in the view we had taken of the nature of the case and of our treatment. Shortly after Mr. Syme's arrival, I was obliged to leave the patient for an hour and a half. I returned at 2 P.M.; and, to my great surprise, found that the man was not only alive, but apparently better. The pulse was good, and the breathing was quieter, and more regular; but the locked-jaw, and the opisthotonic arch of the back, proclaimed that the case was still desperate. Violent convulsions came on at three o'clock; the features were distorted, and the bleeding tongue was pushed up against the teeth so as partly to protrude through their crevices. The last time he swallowed, was about a quarter past two o'clock After several violent fits of convulsions, he expired a few minutes before 4 P.M., the body having previously become colder and colder, and the surface more and more livid. He died in a state of asphyxia. Up to a very short time before death, the churning sound was distinctly heard through the stethoscope; but it was much feebler, and more confused than in the early part of the day.

At the Inquest, in reply to a question by the Coroner, Mr. Syme said that a post-mortem examination was "not necessary to explain the cause of death; but that, for the sake of science, it was important that one should be made." Immediately after the Inquest, at the request of Dr. Willis, in his presence, and with the concurrence of the relatives, I made an anatomical inspection of the body. The autopsy was performed on the third day after death.

General Appearance.—The body was much emaciated; some very slight indications of incipient putrefaction were present.

Neck.—The great vessels of the neck were uninjured. The skin was carefully dissected away from the parts through which the needle had passed, when it was found that a vein, running almost exactly in the mesial line upwards and downwards, was the vessel which had been injured.[1] Its coats were thickened and rigid. Its calibre was such as readily to admit a bougie, of the size of a crow-quill. It had been transfixed by the seton-needle, which had made a gap in the anterior wall, leaving posteriorly about two thirds of the rigid tube uninjured.

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[1] This vessel was the anterior jugular vein. In place of a single

The diseased vein which had been wounded, came down nearly in a straight line from the under surface of the chin; about the lower third of the neck, it began to diverge to the right, till it joined the external jugular immediately above where that vessel dipped to join the internal jugular vein, under the sternal origin of the sterno-cleido-mastoid muscle.

Chest.—The lungs were considerably gorged, and entirely filled the cavity of the thorax. There were strong pleural adhesions posteriorly, but none anteriorly on either side. Before proceeding with the examination, double ligatures were applied to the venæ cavæ. The heart occupied a large space. The right auricle had an elastic feel, and before it was opened it was evident that it was distended with air: the left auricle was flaccid. On pushing a scalpel into the right auricle, a small quantity of blood bubbled out, with at first a slight hissing noise. On fully opening up this chamber of the heart, the contents were found to be partially congealed blood, intimately mixed with bubbles of air. These were very numerous, notwithstanding the air which had escaped by the opening made by the scalpel. Most of these bubbles of air were about the size of a millet-seed; but a few of them were as large as

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vein, there are generally two. Professor Schuh of Vienna, in his paper from which I am about to quote, incidentally states, that upon one occasion, in performing the operation of tracheotomy, he opened the middle jugular vein, and that some air was drawn into the circulation. The effects produced are not stated.

small shot. There was also, in the right auricle, one small, pale, consistent, fibrinous clot. The pulmonary artery was filled with intimately commingled blood and air: it did not contain any clots. Saving the presence of a minute quantity of fluid blood, the ventricles were empty. If permitted, I should have examined the veins over the whole body, and also the brain and liver. Unfortunately, the length of time occupied in exploring what has been described, and the lateness of the hour, rendering the relatives impatient, obliged me to terminate the inspection.

I am not aware of any recorded case of death from the entrance of air into a vein, so full of instruction as that now detailed—probably because in no other instance was the opportunity for observation so long, and so ample. If an experiment had been deliberately planned and skilfully performed, it could not have shed more light upon the subject. The characteristic and immediate effects were strikingly exhibited: they subsided; and then the secondary or asphyxial phenomena became equally well manifested. The first shock which the vital functions sustained, was caused by the rapid distension of the right auricle and its inability to contract upon its elastic contents. Had the distension been a little more complete and rapid, instant death would have been the result. As it was, the heart partially regained its power; and although the condition of the heart, and frothy blood in the auricle, the pulmonary artery, and its branches, produced an obstruction to the passage of the blood through the lungs, adequate ultimately to induce fatal asphyxia, the obstruction was yet sufficiently moderate to enable us to analyse all the phenomena as they presented themselves, and to point out to us, that had this obstruction been still more moderate, the difficulty might have been surmounted, and recovery from the accident might have occurred.

The history of this case clearly shows, that in such accidents, after the first danger is over, the patient may perish from asphyxia, induced by a gradually augmenting pulmonary obstruction. What I saw in this case, along with a careful reperusal of Erichsen's experiments (*Edin. Med. and Surg. Journ.*, Jan. 1844), has fully satisfied me that, in a large number of deaths which occur from the entrance of air into the veins, asphyxia is the principal and immediate cause of death. It may be stated as a conclusion from this case, from numerous other cases, and also from experiments on animals, that if the first shock of the accident be got over, *the degreee of subsequent immediate danger is in proportion to the amount of obstruction to the passage of the blood through the lungs.*

More remote subsequent danger may result from inflammation of the lungs. Some of the animals which I experimented upon, recovered from the immediate effects of the introduction of air, but ultimately died from pneumonia. The experiments are detailed in my Thesis.

When death takes place after the lapse of a week or ten days, the fatal result may be wholly independent of the entrance of air, and may depend upon purulent matter entering the circulation at the seat of the operation. In a case recorded by Professor Schuh, of Vienna, in a paper on Steatomatous Tumours, published in the *Deutsche Klinik* for 6th April, 1850, this actually happened. During the removal of a steatomatous tumour from the neck, a sound was heard resembling that known to be caused by the entrance of air into a vein. A finger was immediately placed upon the spot at which the air was supposed to have entered, when the sound ceased. No remarkable symptoms were witnessed in the patient. After a pause, the operation was resumed, when, a second time, air was heard to enter, and was in a similar manner a second time as promptly arrested. The effects were slight, but characteristic. I subjoin the history of this interesting case, which has not yet appeared in any of the English or French medical journals received in our London medical libraries.

SCHUH'S CASE.—*Entrance of Air by the Subclavian Vein during an Operation: Survival for ten days: Purulent Deposits.*

A tanner, aged 50 years, had been three times operated on for a swelling in the region of the right pectoralis major muscle. The last operation had been performed three months ago, but the disease had returned. He had a tumour of the size of two fists: it was painless, had a very uneven surface, and was firmly connected with the pectoral muscle: it extended very nearly to the clavicle, and could not be moved by drawing aside and raising the arm. The skin over it presented cicatrices (the result of former operations) extending as far as the axilla, and inseparably united with the substance of the tumour. The consistence was generally hard; but two of the most projecting lumps were soft, very elastic, and apparently fluctuating: the skin over them was healthy, and moveable. An examination from the axilla showed an unevenness and hardness on the posterior surface of the pectoral muscle. As the patient persisted in his resolution to have the tumour removed, Dr. S. loosened the mass, and removed the greater part of the pectoral muscle, which was inseparably united with it. While Dr. S. was endeavouring to divide the last remaining attachments of the growth, at the lower edge of the clavicle, and for that purpose was pushing it upwards, and somewhat dragging on it, he suddenly heard *the sound of the entrance of air into an opening in the subclavian vein, without hæmorrhage.* He immediately placed his finger on the spot where he had last cut, and watched the patient. He was already recovered from the insensibility produced by chloroform, and showed no signs of the entrance of air. There was not even any change in his countenance. There was, indeed, some inclination to vomit; which, however, as well as the slow pulse, Dr. S. ascribed to the chloroform. The operation was concluded, and an assistant was directed to keep up pressure with his finger. Dr. S. endeavoured to apply a ligature; but, as soon as the finger was removed, the blood gushed out in such quantity as to render it impossible to see the wound. A small compress was then laid above the clavicle, another pushed under it, and the two were held together by Hesselbach's compressorium. In two hours, being summoned on account of hæmorrhage, Dr. S. removed the compressorium, and was about to introduce his finger under the clavicle. Before he could do this, air was again distinctly heard to enter the vein. He felt the pulse immediately, and found it *much accelerated, very weak, and extremely irregular; but this continued only a few seconds. At the same time, the patient felt slight nausea, and inclination to vomit:* but these symptoms passed away with the acceleration of the pulse. Hæmorrhage was restrained by the application of Dupuytren's intestine-forceps, which were left on for forty-eight hours.

On the first days after the operation, the patient felt well, with the exception of unquenchable thirst; the pulse was normal.

Fourth day. Slight sopor; delirium at night; pain in the chest; and difficulty of breathing.

Fifth day. The wound was dirty, and moderately inflamed; heat of skin normal; the right arm was much warmer; and the pulse, on this side, not accelerated, but stronger. The muscles of the right forearm exhibited involuntary contractions. There was great thirst, and the head was warm: the urine was normal.

Sixth day. Wound cleaner; pulse normal; thirst great; tongue covered with a white fur. The patient had a feeling of exhaustion, and of great heat, although the skin was only of normal warmth. Right arm hot; muscular contractions fewer. Pain in the left axilla; head warmer; sleep interrupted by dreams; urine very thick.

Seventh day. Night restless, from severe pain in right knee, increased by the least motion or pressure; wound clean; head and right arm warmer, the other parts of normal warmth; pulse normal; thirst great; urine thicker; frequent complaints of cold.

Eighth day. Delirium in the night. The left knee very tender, and swollen about the patella; the right knee had also begun to be painful, without exhibiting any swelling. Wound clean; eye coloured yellow; pulse slightly accelerated; heat of skin normal, except in head and right arm, in which last frequent subsultus was observed. The patient suddenly lost his power of speech, and had a grinding motion of the lower jaw; the movements of the sound hand were unsteady, and there was a red painful swelling on the left forearm. There could be no doubt now of the presence of purulent deposits. Speech returned in the afternoon. The patient was very loquacious, and laughed at his own figure, during his delirium.

Ninth day. Pulse somewhat accelerated; heat of skin increased over the whole body. The patient was bathed in sweat; did not speak; and had a sunken countenance, with yellowness of the face. There was œdema at the inner side of the right upper arm; respiration accelerated; urine suppressed. No pain was produced by pressure in the region of the wounded vein.

Tenth day. The patient died.

Post-mortem appearances. The subclavian vein was plugged with a clot of blood, commencing at the wound, and extending two and a half inches towards the axilla. The coagulum had already undergone purulent softening in the centre. The length of the wound in the vein, which was plugged by coagulum, was two or three lines. The fibrinous coagula in the heart were of a yellow colour. At the apex of one of the lungs, there was a metastatic deposit of the size of a nut. The left knee-joint contained pus, which was also found in the cellular tissue of the left forearm. There were two ounces of clear serum in the lateral ventricles of the brain. (*Deutsche Klinik*, 6 April, 1850.)

From cases and experiments now and previously published, important pathological facts and practical lessons clearly flow. They render the subject simple both in theory and practice.

1. The entrance of air into the veins does not necessarily give rise to exactly the same symptoms. The

intensity of the effects depend upon the degree in which the action of the right side of the heart is arrested or impeded by its over-distension, and upon the degree of asphyxia induced by the impediment to the passage of the blood through the lungs.

2. The indications of treatment are threefold:—*first*, to relieve the distended right auricle; *secondly*, to treat the impending or actually present asphyxia; and *lastly*, to prolong life by every possible means, in the hope that the air may be all absorbed, and the passage of the blood through the small vessels of the lungs again be made easy.
3. In the most rapid class of cases, in which death is suddenly threatened from paralysis of the heart from over-distension, we must first strive to relieve the organ from that condition. When the phenomena are chiefly those of asphyxia from more gradually increasing obstruction in the lungs, the various means for treating asphyxia must be resorted to, and among these, in many cases, I believe the alternate use of the hot and cold douche will be found to be very valuable, especially if combined with stimulants judiciously varied and skilfully administered externally and internally. In many cases, repose, dashing cold water in the face, keeping the surface warm, and TIME may be the only means which ought to be used. A case communicated to me by Sir B. C. Brodie (and about to be quoted) clearly establishes the value of gaining time.

I believe it often happens that air enters the veins during operations. Sometimes the quantity is so small as to produce no notable manifestations; and at other times, after the characteristic symptoms of the accident have been produced in an alarming degree, the case has terminated favourably without special treatment.

A very apt illustration of this remark has been kindly communicated to me in the following letter from Sir Benjamin C. Brodie:

"21st *March*, 1850.

"MY DEAR SIR,—I send you the case, which is quite at your service. Mr. Kenedy, of Tavistock Square, attended the patient with me. Yours truly,

"B. C. BRODIE.

"TO DR. CORMACK.

"BRODIE'S CASE.—*Admission of a small quantity of Air by a Wound in a Branch of the Internal Jugular Vein.—Symptoms of Short Duration.—Complete recovery.*

"A young lady consulted me in the year 1842, on account of a large tumour occupying one side of the neck. The tumour was fully covered by the sterno-cleido-mastoideus muscle; but it was quite movable on the parts below. In the operation for the removal of the tumour, I found it necessary to divide the muscle, which lay over it. In the course of the dissection, it was discovered that the internal jugular vein was so intimately connected with the under surface of the tumour, as to be inseparable from it: the tumour itself was lying in contact with the carotid artery and pneumogastric nerve. Under these circumstances, I was led to apply a ligature to the vein above and another to the vein below the tumour, and then remove about three inches of that vessel with the tumour. Towards the conclusion of the operation, on dividing some parts near the clavicle, a branch of the principal vein was wounded, when immediately a hissing sound was heard, which I concluded to have been produced by air entering the wounded vessel. The patient became faint, so that the pulse at the wrist could scarcely be felt; and she was at the same time insensible. I caused her to be laid on the floor, where she remained insensible and faint for half an hour, and then gradually recovered, so that she could be removed to bed. On the following day she was apparently well, but wholly unconscious of what had occurred, from the time of her becoming faint, until the expiration of several hours. The tumour was of a fibrous structure—not apparently malignant—and two or three years afterwards, there had been no return of the disease. No inconvenience had ever arisen from the removal of the internal jugular vein."

Another interesting illustration of the good hope which there is of recovery when the quantity of air admitted is small, occurred in 1848, in the practice of Mr. Gay. It has been detailed and commented upon in an instructive manner by Mr. G. F. Lane, in the *Medical Gazette* for May 31st, 1850, p. 926.

The following is a slightly abridged account of the case.

GAY'S CASE.—*Admission of Air by a Wound in a Branch of the Axillary Vein.—Alarming Symptoms.—Complete Recovery.*

Mrs. Simkiss, æt. 46, a married woman, of light complexion, usually of good health, and the mother of eight children, had a painful tumour in the axilla, which had first appeared on weaning her youngest child six years old. On the 7th of February, 1848, it was removed by Mr. Gay, the patient being under the influence of chloroform. In dissecting out the tumour, a tributary branch of the axillary vein was wounded near the chest: the opening was small. Air was heard, both by Mr. Gay and myself, to enter the orifice, accompanied by a peculiar noise, sufficiently loud to be audible to all present: the sound was quite characteristic of the entrance of air and fluid through a contracted opening, or of air drawn through fluid—something between gurgling and hissing, and resembling the sound heard when, in drawing the last portion of a fluid from a vessel into a syringe, some air accompanies it. A great change was immediately noticed in the condition of the patient; the powers of the circulation sank; the woman, who had nearly recovered from the effects of the chloroform, became exceedingly faint, and sank down in the chair. Mr. Gay instantly detached the portion of gland he was engaged in removing, and applied pressure above the opening in the wounded vein. The pulse was now imperceptible; the face deadly pale. Brandy was freely given, the wound was closed as speedily as possible, the arm was brought to the side, and the woman was placed in the recumbent position. The surface of the body became cold, and the patient seemed scarcely to breathe. Ammonia was held to the nostrils; bottles of hot water were applied to the feet; the legs and arms were rubbed continuously; the feet and hands were immersed in hot water; hot brandy and water was poured down the throat in considerable quantity, and subsequently some ether. After these measures had been continued for an hour and a half, the pulse at the wrist could be detected beating regularly, and the woman began to regain her consciousness, which she had lost immediately after the entrance of air into the vein. After this, she fell into hysterical fits, which soon passed off again, and after two hours she was placed on the bed, so far recovered as to admit of a compress being applied, and the arm bandaged to the side; the pulse beating 80 in a minute, regular, but feeble. She was ordered spiritus ammoniæ aromaticus, in mistura camphoræ, every four hours. She recovered without any bad symptoms. There has been no return of the disease; and her general health has been better since than before the operation.

Regarding the circumstances which modify the effects produced by the entrance of air into the veins, I entertain substantially the same opinions I expressed in my Thesis 1837, and which have been largely noticed by numerous subsequent writers, and likewise pretty fully adopted by the two authors who have since that date most elaborately discussed the subject, viz. Professor Wattmann of Vienna, and the late Professor John Reid of St. Andrew's.

[The able critical essays of John Reid and Wattmann contain no new experiments.]

JOHN REID, after giving the literary history of the subject in France, thus proceeds:

"The only authors in this country who have written on this subject since the time of Dr. Brown Langrish, who only made one imperfect experiment (*Physical Experiments* *on Brutes*, 1764), are Dr. Cormack (*Prize Thesis*, 1837), Sir Charles Bell (*Surgical Essays*, 1840), and Mr. Erichsen (*Edinburgh Medical and Surgical Journal* for January, 1844).

"The treatise of Dr. Wattmann contains no new experiments upon the lower animals, and is chiefly occupied, as its title would lead us to expect, in examining the causes that favour the accidental entrance of air into the venous system in the human species, the modes of preventing this, the remedies to be employed when it does occur, its other surgical relations, and also its bearings on Forensic Medicine. He points out that the surgeon by employing a certain procedure can prevent, in most cases, at least, the entrance of a fatal quantity of air; and he describes a new method of securing the wounded vein when not more than half its circumference is cut through, by which the further entrance of air is prevented, and the hæmorrhage arrested from such large veins as the internal jugular and subclavian, without very much diminution of the calibre of the vessel. He also gives the details of four very interesting examples of the accidental entrance of air into the veins which occurred in his own practice, and though one of these was published as early as 1823, they have hitherto been entirely unknown to those who have collected and commented upon such cases in France and in this country. In giving an account of the physiological part of his subject, he is necessarily led to examine the results obtained by the different experimenters on the lower animals—from which source almost all our knowledge of it is derived—and in doing this he shows a perfect acquaintance with all previously published on the question." See p. 542 of Reid's *Physiological, Anatomical, and Pathological Researches*: Edinburgh, 1848.]

WATTMAN in explaining the discrepancies in the accounts of different cases of the accidental entrance of air mentions the following causes of variation: "1st. The erect position of the patient during the operation; for the more the part operated on is higher than the heart, so much the less are the veins distended with blood, and so much the more readily will air enter them in greater quantity when opened, if at the same time their walls are prevented from being forced together by the atmospheric pressure: 2nd. The partial division of the vein, permitting the air to pass on mixed with the blood which still continues to flow onwards to the heart, as I myself observed in the human species and as Cormack and Mercier mention: 3rd. The complete division of the vein in allowing the air to enter in cases where the proximal end gapes, or is kept expanded; in such cases Cormack's observation is correct that air unmixed with blood will rush on to the heart." *Sicheres Heilverfahren bei dem schnell gefährlichen Lufteintritt in die Venen, und dessen gerichtsärtztliche Wichtigkeit. Von Dr. Ch. Jos. Edl. v. Wattmann, Professor der praktischen Chirurgie, und der ersten Chirurgischen Klinik Vorstcher des Operations-Institutes an der k. k. Universität in Wien, u. s. w. Wien,* 1843.

WATTMANN gives four surgical cases from his own practice in which air entered the circulation.

EXTRACTS FROM PARIS THESIS.

The title of my Graduation Thesis defended at Paris on the 4th August, 1870, *is as follows:*—"De l'Entrée de l'Air dans les Orifices Béants des Veines Utérines considérée comme Cause de Danger et de Mort subite peu de Temps après la Délivrance."

The materials used in that Thesis are nearly the same as those previously employed in my English papers on Air in the Organs of Circulation, now reprinted in this volume of "Clinical Studies." *Some additional facts and remarks are contained in the four subjoined extracts.*

1. Right Side of Heart distended by Air entering Occipital Sinus.
2. Anatomical Peculiarities of the Uterine Veins immediately or soon after Delivery.
3. The same Conditions which favour the Introduction of Air into the Circulation by the Uterine Veins after Delivery tend also to favour the Production of Embolism.
4. Treatment.

RIGHT SIDE OF HEART DISTENDED BY AIR ENTERING OCCIPITAL SINUS.

"Il est une observation très-intéressante de M. le professeur Cl. Bernard, à propos de cette question, qu'il est bien de remarquer. M. Cl. Bernard, dans ses tentatives pour atteindre les racines du nerf spinal accessoire des chiens, par trépanation de l'os occipital, s'aperçut que l'air s'introduisait dans les sinus des veines et distendait le côté droit du cœur.

"Il conclut que dans ces cas, la mort ne résultait pas de l'hémorrhagie mais de la pénétration de l'air dans la circulation.[1] (P. 31.)

ANATOMICAL PECULIARITIES OF THE UTERINE VEINS IMMEDIATELY OR SOON AFTER DELIVERY.

"On a donné le nom de *sinus* aux veines utérines, lorsqu'elles ont subi cet élargissement qui a lieu chez elles—comme dans les autres tissus de la matrice—pendant la grossesse. La paroi externe des sinus adhère intimement au tissu de l'organe, de telle sorte qu'ils restent béants lorsqu'on vient à diviser celui-ci.

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[1] Archives Générales de Médecine. 1844. P. 54.

"Les veines utérines forment quatre groupes principaux : les deux supérieurs accompagnent les artères utéro-ovariennes et vont se jeter dans la veine rénale gauche, et dans la veine-cave inférieure pour celui du côté droit : les deux groupes inférieurs accompagnent les artères utérines et vont se jeter dans les veines hypogastriques. Elles s'anastomosent les unes avec les autres, ce qui pourrait faire supposer à un observateur superficiel, qu'elles sont tortueuses : mais, comme le dit Cruveilhier, les veines contenues dans l'épaisseur des parois utérines ne présentent aucune trace de la disposition flexueuse des artères correspondantes.

"Ces anastomoses forment là un vrai tissu érectile, comme M. le docteur Savage de Londres l'a minutieusement décrit.[1] M. Paul Dubois dit également (1^{re} livraison, p. 175) que les communications des veines entre elles sont multipliées, que, même dans l'état de vacuité, l'appareil vasculaire veineux de l'utérus présente tous les caractères du tissu érectile. Il est important de se souvenir que les veines utérines ne sont pas flexibles : il y a une autre particularité anatomique cependant qui tend tout spécialement à les maintenir béantes après la délivrance : c'est leur adhérence intime au tissu de l'utérus qui leur forme une sorte de tunique musculeuse.

"Faites une section des parois utérines et vous remarquerez une apparence qui rappelle parfaitement celle que présente une section du parenchyme du foie : dans les deux cas, la section laisse béants les vaisseaux divisés.

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[1] SAVAGE (Henry, M.D.):—Surgery, Pathology, and Anatomy of the Female Pelvic Organs. *Second Edition:* London; 1870.

“Les particularités anatomiques des sinus utérins après la délivrance étant de cette nature, et de plus, vu qu'elles débutent par de grands orifices dans la cavité utérine, où à la suite de différentes causes l'air peut pénétrer facilement, il est surprenant que l'introduction de l'air par les orifices béants ne soit pas une cause beaucoup plus fréquente de danger et de mort.

“La nature possède contre ces accidents deux puissants agents qui ordinairement empêchent le danger d'une hémorrhagie utérine excessive. Le premier, que tout le monde admettra, est la faculté contractile des parois utérines, qui aide puissamment à clore ces ouvertures béantes ; mais il en est un second, sur lequel mon attention fut attirée pour la première fois au mois de novembre ou de décembre 1860, par mon ami, le professeur John Reid, et que je n'ai jamais vu signalé dans aucun traité d'accouchement. J'étais un jour dans le cabinet de M. Reid au Royal Infirmary d'Edimbourg, où il était attaché comme professeur de pathologie, lorsqu'il me montra l'utérus qu'il avait extrait du corps d'une femme morte quelques heures après sa délivrance. Il me fit remarquer que les bouches des sinus forment des ouvertures arrondies, beaucoup plus petites que l'intérieur des sinus eux-mêmes ; ce fait avec les démonstrations qu'il avait déjà données touchant les rapports anatomiques entre les vaisseaux de la matrice et ceux du fœtus dans l'espèce humaine, était, suivant lui, une particularité qui protégeait l'accouchée contre l'hémorrhagie et contre l'entrée de l'air. Reid en faisant une injection à la veine ombilicale réussit à injecter des portions de villosités du placenta (*placental tufts*) qui étaient restées à l'intérieur des sinus utérins après l'expulsion du placenta de l'utérus à l'accouchement. Voici ce qui arrive toujours. Ces parties du placenta sont tellement adhérentes à la couche flexible des sinus utérins qu'elles se trouvent déchirées. L'hémorrhagie ne provient pas alors des vaisseaux ainsi déchirés. Les fragments de villosités placentaires forment le noyau de coagulations qui bouchent l'orifice dont l'étroitesse relative retient la villosité, et s'oppose ainsi, jusqu'à un certain point, à la production des accidents. M. Reid dit :—'J'ai constaté sur un utérus provenant d'une femme qui était morte vingt-quatre heures après la délivrance, et que j'ai pu examiner grâce à l'obligeance de M. le professeur Simpson, que, tandis que quelques-unes des bouches des sinus utérins étaient bouchées par les coagulations, il y en avait un grand nombre de vides. Je ne pus découvrir de touffes dans celles qui étaient vides, tandis que dans celles qui se trouvaient remplies de coagulations, je pus constater plusieurs touffes de vaisseaux du placenta enveloppés de coagulations, lorsqu'on les plaçait sous le microscope après les avoir broyées.'[1]

"Il en a été assez dit pour expliquer 1°: comment les accidents en question peuvent survenir, et 2°: combien ces accidents sont rares. Il faut nous rappeler, en ce qui concerne le premier de ces cas, qu'à l'endroit d'où le placenta s'est trouvé détaché, le calibre des sinus utérins est assez grand pour y introduire le petit doigt: puis, en ce qui concerne le second, souvenons-nous que, si par hasard les prévisions de la nature pour refermer ces conduits après la délivrance viennent à échouer, une hémorrhagie utérine ou l'introduction de l'air dans les veines peuvent survenir. Il y aura probablement une combinaison des deux accidents, ou bien la pénétration de l'air pourra suivre l'hémorrhagie utérine.

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[1] Reid (John, M.D.):—Physiological, Anatomical, and Pathological Researches. Edinburgh: 1848.

THE SAME CONDITIONS WHICH FAVOUR THE INTRODUCTION OF AIR INTO THE CIRCULATION BY THE UTERINE VEINS AFTER DELIVERY TEND ALSO TO FAVOUR THE PRODUCTION OF EMBOLISM.

"Les mêmes conditions qui favorisent l'introduction de l'air doivent également occasionner souvent l'embolie. Un courant d'air peut entraîner dans la circulation veineuse des caillots qui n'adhéreraient que faiblement aux orifices des veines utérines. Je pense donc que, dans plusieurs cas où la mort subite après la délivrance a été attribuée à la pénétration de l'air, cette mort a veritablement été occasionnée par l'embolie, bien qu'il soit peut-être parfaitement vrai que l'air se fût également introduit. Cette question est du reste beaucoup trop complexe pour la traiter incidemment: il me semble cependant que je dois signaler le rapport qui existe entre elle et le sujet de cette thèse; et que je puis avancer que quelques cas de mort subites, après la délivrance, et que l'on a attribués à l'introduction de l'air, pourraient avec plus de vraisemblance être rapportés à l'embolie. (P. 46.)

TREATMENT.

"Les indications de traitement sont au nombre de trois: *primo*, diminuer la distension de l'oreillette droite; *secundo*, porter remède à l'asphyxie menaçante ou actuelle; et *tertio*, prolonger la vie par tous les moyens possibles dans l'espoir que tout l'air puisse être absorbé et que la circulation du sang se fasse de nouveau à travers les petits vaisseaux des poumons.

"Dans les cas les plus rapidement mortels où la mort menace d'être subite, par suite de la paralysie du cœur due à trop de distension, il faut d'abord essayer de soulager cet organe et cet état. Lorsque les phénomènes qui se présentent sont principalement ceux de l'asphyxie causée par l'obstruction croissante dans les poumons, il faut avoir recours aux remèdes qu'exige l'asphyxie, parmi lesquels on trouvera de grande utilité l'emploi de douches chaudes et froides alternativement, surtout si le praticien les varie habilement et les administre intérieurement et extérieurement.

"Peut-on employer utilement la glace pour diminuer la distension du cœur droit, selon la méthode pratiquée avec tant de succès contre le ballonnement excessif du ventre dans la fièvre typhoïde? S'appuyant sur l'analogie, M. le docteur Michel Peter pense que, dans ces cas de distension du cœur droit par la présence de l'air, on pourrait par des applications de glace sur la région précordiale, diminuer d'une façon toute physique, par l'action du froid, le volume de ce fluide gazeux, et par suite, rendre moindres, tout à la fois, sa force élastique et l'obstacle qu'il apporte aux contractions du cœur. C'est, en tous cas, un moyen rationnel et qui n'a rien de périlleux.

"Les seules mesures à prendre, dans de certains cas, sont de jeter par intervalle de l'eau froide à la figure, de maintenir la chaleur à l'extérieur et mettre le malade dans le repos absolu. Il ne faut jamais oublier qu'il est de la plus haute importance de gagner du temps." (Pp. 26 and 27.)

ENTRANCE OF AIR

BY THE OPEN MOUTHS OF THE

UTERINE VEINS

CONSIDERED AS A CAUSE OF DANGER AND DEATH AFTER PARTURITION.

[*From 'London Journal of Medicine,' October*, 1850.]

AIR ENTERING THE OPEN MOUTHS OF THE UTERINE VEINS AFTER PARTURITION MAY CAUSE DANGER AND EVEN DEATH:

CRITICAL EXAMINATION OF SOME ALLEGED CASES.

LEGALLOIS, in 1829, when experimenting upon animals, with a view to elucidate the effects of loss of blood and abstinence during gestation, observed, in three different cases, that air penetrated into the vena cava inferior and uterine veins; and that this was followed by instantaneous death. He was naturally much struck with the coincidence; and properly connecting the two circumstances as cause and effect, he has asked—in the memoir which contains the experiments referred to—Whether, in some of those sudden and unexpected deaths which have occurred after delivery, and in which no explanatory lesions have been found on dissection, the entrance of air into the veins has not been the cause of death?[1] Ollivier has also suggested a similar explanation of certain cases of sudden death after parturition.[2]

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[1] LEGALLOIS:—Ann. Hebdom. de Médecine, tom. iii, p. 183. Paris: 1829.

[2] OLLIVIER:—Dictionnaire de Médecine: Article, AIR. 2nd Ed. Paris.

In my Thesis, published at Edinburgh in 1837, in noticing these opinions of Legallois and Ollivier, I made the following remarks :—" There are various circumstances which render it possible that in some instances in which women die unexpectedly after parturition, and when all seems to be going on well, death is owing to air entering the circulation by means of the open mouths of the veins communicating with the uterine sinuses. These orifices, immediately after the separation of the decidua, are very large. They have been made the subject of investigation by many modern as well as old anatomists and obstetricians; and, upon the whole, the various descriptions correspond. Burton (writing in 1751) says, that the uterine sinuses in the ninth month of gravidation are so large as to admit the end of the biggest finger; and their orifices that open into the cavity of the womb will at the same time admit the end of the little finger. (*New System of Midwifery*, p. 19, Ed. 1751.) As the uterus not unfrequently contracts and expands alternately with considerable energy after the expulsion of the fœtus, it is quite reasonable to suppose, that air may sometimes be sucked into the gaping mouths of the uterine vessels in sufficient quantity to prove fatal to a woman exhausted with the fatigues of labour." [See p. 26 of this volume.]

Thirteen years have elapsed since the Thesis now quoted from was published: but, though during that period numerous systematic treatises on Obstetrics have appeared, I am not aware that in any one of them even a single line has been devoted to this subject. Notwithstanding this remarkable neglect, as the subject demands attention from its being one of great practical importance and scientific interest, I again bring it before the notice of the profession, trusting that the meagreness of the information to be communicated may be largely supplemented by others of ampler experience.

Many authors refer to this sucking in of air by the uterus, without however in any way connecting it with the immediate subject of this paper. It is sufficient, however, to give a single illustrative quotation from a recent work.

The following passage is taken from Dr. Charles Meigs' *Letters to his Class, on Females and their Diseases:* "I have," says the author, "often been present at the discharge of large quantities of gas from the genitalia. A woman seized with her first labour-pains, and bearing down with great violence, thrusts not the child only, but the placenta also forth upon the bed; and in bearing down with the violent force of the labour-tenesmus, she pushes the very womb itself to the bottom of the pelvis, shortening the vagina in so doing, wrinkling and crushing it down to the os magnum. As soon as the tenesmus is over, the resiliency or elasticity of the tissues recovering its power, the womb rises again to a certain height within the excavation of the pelvis; but, as it is a cul-de-sac that rises, it is natural for air to follow it, and the vagina and the womb itself may thus contain air that has been drawn up within them, upon the same principle as that which makes air follow the movement of a piston in a cylinder. Then comes a new pain—an after-pain; or else I may apply my hand to the hypogastrium, and make sure of a good contraction of the womb. If I compress the womb with my hand, and particularly if I push it downwards in the pelvis, I am very apt to cause a quantity of air to rush out at the ostium vaginæ with considerable noise. This I have heard a great many times. So, in making the examination *per vaginam*, when the uterus is very low down, or when, in making use of the speculum, I push the os tincæ far away from the os magnum, air enters the passage and follows the retreating womb. If it be left there, and the woman be seized with a fit of coughing, or if she move quickly, or change her position, the air is pressed out with the sound of the *pet-vaginal.* There is no other way to account for it that is reasonable. So, also, a woman has a heavy womb, with a large loose vagina; she lies on the couch or bed; and the uterus retreats, as La Motte says, drawing air after it; but she rises, or coughs, or turns, and the air is expelled" (p. 289).

If it be admitted that air is drawn into the uterus in the manner thus described, the question remains:—What ground is there for supposing that it may thence pass by the uterine veins into the vena cava, and so on to the right auricle of the heart?

The uterine veins, it must be remembered, are large canals, some of them with open mouths, sufficient to admit the little finger. Nature generally closes them firmly by a coagulum; but an accession of hæmorrhage may dislodge this; or the coagulum may contract and fall out, and thus leave the orifices of the veins patent.[1] This accident may occur hours, days, or (in exceptional cases) weeks after delivery.

The freedom of the communication between the cavity of the womb after delivery and the vena cava inferior may be seen by the most cursory examination of the parts in the dead body of a puerperal woman. Dance says, in his Essay on Phlebitis:—"If even a thick injection be thrown into the vena cava inferior below the emulgent veins, it is immediately poured forth in abundance into the cavity of the womb, and overflows from the vulva; thus proving that, after delivery, the large uterine veins are open in the uterine cavity, and communicate freely with the large abdominal veins."[1]

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[1] There is a remarkable natural arrangement to diminish the risks of hæmorrhage and the entrance of air. *Vide* p. 105 of this volume.

It might, therefore, be anticipated, *a priori*, that air might get into the vena cava, and so onward to the heart of a woman recently delivered, by being sucked into the uterus by the sudden dilatation of that organ, and by thence passing into the orifices of the uterine veins. When the uterus is relaxed, these large openings are gaping from the structure of the parts effectually preventing apposition of their parietes. Unless closed by a plug of coagulum, they are (as I have satisfied myself by examination) perfectly patent. If any obstacle exist—such as a large clot, contraction of the circular fibres of the cervix, or contraction of the sphincter of the os uteri after the air has rushed into the relaxed uterus—it must of necessity be propelled into these openings, should the body of the uterus contract without being able to force the air through the os. I have repeatedly seen the womb become inflated with air after delivery; and when the organ has contracted, have heard the air hissing through the vulva. Should any impediment be offered, in such cases, to the free exit of the air by the os uteri, it must necessarily be forced into the uterine veins unless their mouths are protected by coagula; and thence it would rapidly pass up in the current of the circulation to the vena cava and right auricle of the heart.

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[1] DANCE:—De la Phlébite. Archives Générales de Médecine, t. xviii, p. 481. Paris: 1828.

But, that cases of this kind *may* occur, is not all: they have occurred. From attention not having been sufficiently drawn to the possibility of such accidents, it is probable that few of them have been recognised. Moreover, it is probable that the accident is a very rare one.

Dr. Collins of Dublin, Dr. Murphy of London, and others, long in extensive practice, inform me that they have never seen such an occurrence as the death of a woman from the entrance of air into the uterine veins.

Dr. John C. W. Lever, however, who views the matter in a different light, sends me the following letter:

"12, WELLINGTON STREET, LONDON BRIDGE;
"*March* 16*th*, 1850.

"MY DEAR SIR,—When in Ireland my library was cleaned; and in consequence my papers became so disarranged that I am unable to lay my hand on the rough notes of the cases about which we were lately conversing, and have therefore to trust entirely to memory. All the women were multiparæ; the labours had not been over-tedious; the placentæ were thrown off without assistance; and an inert state of uterus, with hæmorrhage, ensued. This viscus seemed like a softened India-rubber bottle: and the period at which the air was *supposed* to have entered it, was when the hand was withdrawn from the abdomen, after employing forcible compression. There was an accompanying noise, very similar to that heard when a caoutchouc enema bottle is squeezed, and then allowed to fill with air; in fine, I may describe it as a rushing sound. All three patients died speedily; the quantity of blood lost not being, in my opinion, sufficient to account for death. Two were examined; one in cold weather, the other in the very height of summer. The latter presented signs of commencing putrefaction. In neither was there any large quantity of blood in the uterus; but in the sinuses, uterine veins, spermatic veins, and left renal vein, there was indubitable proof of air. This, in the former case, emitted no offensive smell when liberated. All these women had been exposed to marsh malaria; and all had enlarged spleen. I am grieved to furnish you with so meagre a report: but I cannot do more from memory.

"Believe me, dear Sir, yours very truly,

"JOHN C. W. LEVER.

"To Dr. CORMACK."

I have now to mention and comment upon some cases which have been minutely described by recent writers.

BESSEMS' CASE.—*Sudden Death following injection into the vagina of chloruretted water in a case of uterine hæmorrhage. On dissection, discovery of the appearances which are characteristic of death from sudden Entrance of Air into the Veins.*

The case is detailed by Dr. J. Bessems, of Antwerp. His explanation of the cause of death is similar to that which I adopt.

On the 14th October, 1841, a woman, aged 35, suffering from uterine hæmorrhage, was admitted into the hospital of St. Elizabeth, under the care of Dr. Bessems. She was the mother of three children. When at the fifth month of her fourth pregnancy, she had some flooding caused by strong mental excitement. Medical assistance was called in; but abortion took place on the 10th of

October, between three or four days before her admission into the hospital. Being alone, she pulled the cord, and broke it. A midwife afterwards arrived, who introduced the hand to complete the delivery; but, being baffled in her attempts, she withdrew. The patient remained in this state, without hæmorrhage, till the 14th, when, in consequence of a great loss of blood, she was taken to the hospital. On admission, her general condition was tolerably satisfactory: the face was slightly pallid: and the pulse, though of adequate strength, was a little too rapid. On examining the abdomen, no marked symptom presented itself except the large bulk of the uterus, which organ was very appreciable in the hypogastrium. The cervix, which was very soft, was still open; two fingers were easily passed up to the placenta, but, although the attempt was assisted by the contractions of the uterus, it was not found possible to drag out the mass, which had perhaps formed adhesions with the internal surface of the organ. By means of Levret's forceps, some very small portions of the placenta were got away. The hæmorrhage had at this time almost ceased. Dreading to irritate the womb too much by prolonged manipulations, Dr. Bessems injected into its cavity slightly tepid water, and prescribed other measures not described, but merely alluded to as those ordinarily employed in such cases. On the 15th, the following day, the state of the patient seemed to be better. She had lost no more blood, and the pulse was firm and tranquil. The gentleman in attendance (M. Stevens) having tried in vain to extract the remainder of the placenta, prescribed chloruretted injections, which were administered in the morning, at noon, and in the evening, by the surgeon in attendance, by means of a gum-elastic catheter placed within the womb, and adapted at its other end to the pipe of a syringe filled with the fluid to be thrown in, all bubbles of air being carefully excluded. On the 16th, little change took place, and the treatment was continued. In the night between the 16th and 17th, the patient had (about 4 A.M.) considerable hæmorrhage; by 8 A.M., the hour of visit, it had ceased; but the countenance was perceptibly paler, and more yellowish, and the pulse was smaller and more rapid. By digital examination, the cervix was found dilated as formerly, and the placenta was somewhat engaged in it. Some fragments were removed, and the chloruretted injection was repeated, with the same precautions as had been adopted on the two previous days. In an instant, the patient, who had been lying in bed, sprang into the sitting position with her arms extended, crying out that she was being suffocated. The head was thrown backwards; the face became livid; the eyes were convulsively turned upwards; and the expression became fixed. From some convulsive movements of the throat, it was for a moment believed that she was in an hysterical condition. But respiration became jerking, and slower and slower; the body fell backwards; the pulse ceased; and, in spite of aspersion with cold water, and the putting in force of the usual means of restoring from syncope, she died within three minutes from the time of the injection into the uterus.

Dissection, twenty-eight hours after death.—The body was stiff, and presented no trace of putrefaction. Nothing morbid was found in the peritoneum and abdominal viscera. The womb was as large as a good-sized fist: in its texture there was no trace of inflammation or suppuration. Its cavity still contained a portion of placenta of the size of a hen's egg, partly detached, and partly strongly adherent. The inferior vena cava was distended, and contained, in its abdominal portion, several bubbles of gas of considerable size, which could be distinctly seen through the parietes of the vessel. The pleura, lungs, and pericardium were healthy. The heart appeared large; but, on examining it more carefully, it was seen that the increased size principally depended upon the *distension of the right cavities, which exhibited an elasticity of a peculiar character. The vessels leading to and from the heart having been tied, that organ was opened under water, when there escaped a large quantity of gas mixed with blood.* The encephalon presented no morbid appearances.

Dr. Bessems—looking to the state of the right side of the heart and great vessels leading thereto—does not hesitate to ascribe the sudden death to the entrance of air into the circulation—by the uterine veins. It may be asked,—If no injection had been practised, and no possibility had existed of air entering the circulation in the way conjectured, might not an anæmic woman have died as suddenly, and in precisely the same circumstances, from syncope? The anæmic condition of the woman was, we cannot doubt, a predisposing or accessory cause of the fatal issue, inasmuch as anæmia is of itself sufficient to induce irregular action of the heart, and adequate to render suddenly fatal particular disturbing agencies which would be harmless in a normal condition of the blood. When, along with the anæmia induced by loss of blood after parturition, there is a diseased heart—softening of the tissue, or some structural change in the valves—it is easy to conceive slight causes, mental emotions, for instance, which have not been disclosed by words or outward acts, all at once bringing the action of the heart to a stand, and perplexing the attendants by the abrupt termination of apparent convalescence in sudden death. Numerous instances of sudden death after parturition, and when all seems to be going on well, certainly depend upon the facility with which trifling causes may disturb the circulation in women with diseased heart, and suffering from recent loss of blood. In the case of Dr. Bessems, a similar explanation might have been sustained, had the narrative been less circumstantial, and had there been no record of the appearances found on dissection; but, with the facts before us, we must believe that, however much other causes may have been accessory or predisposing, the injection of air into the uterine veins was the immediate cause of death. This is established by the distended condition of the right auricle, and by the large quantity of air found in the vena cava inferior.

LIONET'S CASE.—*Sudden Death after Natural Delivery, without known cause: Air in the Veins.*

The following case published by Lionet, of Corbeil, claims attention in this place.

A lady, aged 27, of ordinary height, stout, fresh, and well-looking, but very excitable and subject to attacks of hysteria, in the eighth month of her pregnancy, while looking at her husband who was getting into a carriage, saw the horse fall down; she uttered a cry of terror, became very pale, and at once lost the power of speech. The midwife first made her use a pediluvium, then an entire bath. The aphonia persisting, Lionet was summoned three or four hours after the accident. The power of motion and the intellect were unimpaired. The patient made herself understood by signs or by writing. A copious bleeding, and several cups of an infusion, having failed to restore the voice, at the end of five or six hours a large sinapism was applied to the cervico-dorsal region. The pain was so acute as to cause convulsive movements; but speech was restored. The pregnancy continued its natural course, and the movements of the fœtus were felt until the appearance of labour-pains twenty-three hours later. The midwife observed nothing wrong, except that the patient was paler and more feeble than usual: she had to be carried to bed. The os being very slightly dilated, the midwife left the patient for some time; on returning in about half an hour, she found the head in the vulva. The child, although well formed, was born dead. The placenta soon followed: the uterus contracted properly, but the patient's strength did not return; she remained extremely pale, and the midwife, having exhausted her resources, sent for Lionet.

He did not see the patient till three hours after her delivery. She was then extremely pale, making constant efforts to vomit, and breathing with difficulty. The circumstances of the delivery were related to Lionet: he was assured that there had been no hæmorrhage: and, on his examining the linens, they did not seem to him to have imbibed an unusual quantity of blood. The uterus formed an ovoid mass, which raised the abdominal walls. A little serous exudation escaped from the vulva. On introducing the hand into the cavity of the uterus, Lionet found a few clots. Fearing that a rupture had occurred, he used a cold injection. He removed the pillows, so as to place the patient in a horizontal position; and he compressed the aorta, not only with the view of arresting the hæmorrhage (supposing that a rupture had taken place) but also to favour the flow of blood to the head, and to the heart the pulsations of which were irregular. The hands were plunged into a warm mustard bath, while cordial drinks and an ether draught were administered: ammonia and hot frictions were employed externally. The patient constantly complained of being suffocated, calling for air to save her from dying. In an hour, Lionet sent for Dr. Petit, sen., who again examined the uterus. The patient expired under their hands after two hours of constant attendance—five hours after delivery—without having experienced any other relief than the grateful impression of the currents of air which were directed upon her face.

The child was of average strength and well formed. Its limbs were contracted and rigid, as if they had just been convulsed: this contraction lasted eight or ten hours after birth.

The Post-mortem Examination was made about thirty hours after death, at a temperature of 12-14 R., by MM. Petit, sen. and jun., Surbled, and Lionet. The body was of a yellowish white, like wax. The stomach and intestines were distended by a large quantity of gas; the mucous membrane was pale, and perfectly healthy. The uterus was slightly ecchymosed at the sides; it presented no trace of laceration and contained no clots; when water was introduced, it did not escape by any aperture, although the organ was strongly compressed. The surface where the placenta had been attached had a velvety appearance, and exhibited a large number of venous sinuses, without any appearance of rupture.

The vena cava seemed to be enormous, and of a slaty appearance; but as it had been wounded by the scalpel in removing the uterus, the nature of its contents could not be determined. In the supposition that it might contain air introduced from the uterine sinuses, the investigations were directed to ascertain this fact. Having found nothing of importance in the chest, the heart was carefully examined: some bubbles of air mixed with a small quantity of blood were found in the ventricles, especially in the right. On lifting the calvarium, the arachnoid appeared raised by small transparent patches, which were recognised as bubbles of air; they were easily removed by pressure. The membranes and vessels were but slightly gorged. In several of the veins ramifying among the cerebral convolutions small columns of air, separated by columns of red blood, were seen: on pushing these with the finger, they could be united, so as to give to the veins the appearance of pieces of vermicelli several centimètres in length. The same appearance was observed in the veins at the base of the brain. The veins in the limbs were not examined. The following then is a summary of the appearances observed:—No appreciable lesions in the uterus or other viscera: air in the heart, perhaps in the vena cava, and certainly in several of the cerebral veins.

Lionet, after various remarks, puts this question:—Can it be admitted that, in the anæmic state of the patient, the uterine sinuses being empty of blood and not plugged with clots, the introduction of the hand favoured the admission of air during uterine inertia? He replies—I do not know whether this be possible: it is for physiologists to determine.[1] [*Possibly* in this case embolism was the cause of death: *more probably* it was air in the circulation.]

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[1] LIONET:—Journal de Chirurgie, 1845, p. 234.

WINTRICH'S CASE.—*Rapid Death after Parturition. Death attributed to the Entrance of Air into the Uterine Veins.*

Dr. Wintrich, in 1848, communicated to the Medical Society of Erlangen a case of rapid death after parturition, which he attributed to the introduction of air into the uterine veins. Death was preceded by some convulsive movements and suffocation, which symptoms followed the expulsion of the infant and the partial separation of the placenta. Dissection, we are told, satisfactorily demonstrated that air had penetrated into the venous system by the uterine veins.[1] I regret that I have failed in obtaining the original record of this case, and that I am only able to give this very meagre abstract from a French journal.

Professor J. Y. Simpson has communicated the following remarks as an appendix to Dr. John Reid's *Essay on Death from the Entrance of Air into the Veins*:—

"Several years ago," writing in 1849, "I saw," says Professor Simpson, "a case of death a few hours after delivery, which first gave me the idea that death may sometimes occur from the introduction of air into the uterine veins.[2] The patient was an inmate of the Lying-in-Hospital, and was delivered of twins. Dr. Ziegler was called to see her, in consequence of some difficulty connected with the birth of the second child. Post-partum hæmorrhage, with alternate contractions and relaxations of the uterus, supervened; and she seemed to rally very imperfectly from the effects of the flooding. I saw her in an hour or two afterwards. She had then a very weak and rapid, almost imperceptible pulse; an extremely anxious countenance; and here and there was an evanescent *scarlatinoid rash* over the surface of the body. The body was opened a few hours after death, as we were anxious to know if there was air in the veins; and we were, of course, desirous not to incur the fallacy of air arising from decomposition. The abdominal contents were exposed under water. The uterine and hypogastric veins, and lower vena cava, were full of frothy blood, and the air bubbled up. The large veins of the extremities were in the same state."

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[1] WINTRICH:—Journal de Médecine et de Chirurgie Pratiques: Nov., 1848, p. 609.

[2] [The idea belongs to LEGALLOIS, who announced it in 1829.]

In this description, nothing is said of the condition of the heart and lungs—the only organs in which the characteristic and certain evidence of the accident having caused death is to be found. The mere presence of air is no proof that it has caused death.

Simpson adds the following remarks upon the mechanism of the introduction of air in such cases:—"I think we can understand it, when we remember that the interior of the uterus after delivery, especially opposite the late seat of the placenta, is studded with venous orifices; and that, if air does once become introduced into the uterine cavity, from relaxation of the walls of the organ, it will be liable to be *forced* into these orifices, and hence into the general venous circulation, provided the uterus in again contracting is unable to expel its contents through the os uteri."[1]

The case and comments of Professor Simpson are chiefly valuable as an intimation from so eminent an authority that the ideas of Legallois, as to the reality of this accident, deserve credit. The case may or may not have been an example of the accident. The description is by no means convincing: the symptoms during life are not sufficiently detailed, and the existence of frothy blood in the uterine and hypogastric veins, and vena cava inferior, can with difficulty be understood, except by supposing that notwithstanding the shortness of the interval between death and dissection, some decomposition of the blood, with evolution of gases, had commenced. In experiments on animals, and in cases in the human subject, in which rapid death has followed the introduction of air into the veins, frothy blood has been found only in the right side of the heart and in the pulmonary artery: in other parts of the body, the air, if found at all, has not been intimately mixed with the blood, but has existed in distinct bubbles. This is easily explained; for it is the churning of the struggling heart, unable to propel its elastic contents along the pulmonary artery, which causes the frothing of the blood.

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[1] REID (Dr. JOHN):—Physiological, Anatomical, and Pathological Researches, pp. 579–80. Edinburgh: 1849; also in *Edinburgh Monthly Journal*, April, 1849, p. 707.

It would be endless to relate all the cases, which might be cited as furnishing a strong probability that air had entered the uterine veins after delivery, inducing, in some instances, transient but alarming symptoms; in others, occasioning almost mortal effects; and in others, causing, or, together with uterine hæmorrhage, contributing to cause, sudden and unexpected death. Such cases do not furnish data of sufficient accuracy on which to found conclusions. Some cases, however—illustrative of the hazy state of the literature of this subject—seem to be entitled to the consideration they have received in this paper.

This seems to be the most convenient place to notice the *red appearance of the skin*, which is described as having occurred suddenly in some cases of the entrance of air into the veins.

Dr. Warren of Boston relates two cases which occurred in his own surgical practice. The first patient recovered, after being insensible for a considerable time. While still comatose, "the leaden colour in the cheeks," says Dr. Warren, "assumed a *reddish* tinge, and the alarming character of the symptoms was evidently diminished." In the second case, during the period elapsing between the entrance of the air and the death of the patient, says Dr. Warren, the "livid colour of the cheeks gave place to a suffusion of *vermilion red*, and no glow in the cheek of a youthful beauty ever gave one so much pleasure as that flush. But the flush soon passed off:" and the patient died.[1]

In several cases of death occurring two or three days after delivery (some of which had been considered as malignant scarlet fever by the medical attendant), Simpson states that "a red or scarlatinoid eruption was seen upon the cutaneous surface of the patient." In Professor Simpson's already quoted case, which is the only one of the kind fully detailed, there was post-partum hæmorrhage, and "an evanescent red scarlatinoid rash over the body." Simpson asks the following question :—*If the red or scarlatinoid rash, which appeared in the preceding obstetric case upon the surface of the skin, were owing to the entrance of air into the uterine veins, might this symptom be accounted for on the idea that the introduced air*

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[1] WARREN, Dr., in *American Cyclopædia of Practical Medicine*, as quoted by JAMES Y. SIMPSON in *Edinburgh Monthly Medical Journal* for April, 1849, p. 707.

directly mixed with, and oxygenated, the blood in the capillary vessels?

The "rash described by Simpson, and the "reddish tinge" and "suffusion of vermilion red," mentioned by Warren, may or may not refer to the same phenomenon, but it seems reasonable to infer that they do; and such is evidently the opinion of Simpson. Granting that the red appearance was of the same nature in all the cases, granting likewise that air had entered the veins, granting even that it had caused death, I am not prepared to admit that the red appearance was necessarily the result of the entrance of air.

My difficulty in connecting the two phenomena as cause and effect does not arise exclusively from *a priori* reasoning on the subject, but from what I have recently seen in three cases, in none of which, I believe, air existed in the veins; and in one of which, at least, the entrance of air was impossible. I now notice these cases, in the hope that others will, when opportunities occur, make and record their observations with the object of elucidating this point. In the meantime, the elements on which to found a positive or exclusive opinion are wanting. As a contribution towards the facts required, and as my reason for not answering Dr. Simpson's question in the affirmative, I subjoin the particulars of the cases referred to.

CASE.

Red Cutaneous Suffusion—analogous to Blushing—not caused by Air in the Circulation.

About twelve months ago, I was entering one of the quadrangles of St. Thomas's Hospital with Mr. Solly, when he was suddenly hurried into one of his wards where a man (labouring under syphilitic disease of the larynx) was urgently suffering from want of breath. Tracheotomy, being imperatively called for, was quickly resolved on and performed; and the patient was, for the time, at once relieved from the distress and jeopardy of his position. This relief, however, was of short duration, for in two or three minutes after the tube had been introduced, the man gave a sudden movement, which dislodged the tube from its position in the windpipe. From the instrument being plugged up with clotted blood, and from other unavoidable causes, several minutes elapsed before air could again be made to enter the lungs through it. The visage became leaden-coloured, the tongue protruded, the teeth were clenched upon it, the face was convulsed, the pulse disappeared from the extremities, and at last the whole body became pulseless and cold. The man lay for some time cold, with bloated visage, protruded tongue, and in a state of suspended animation from apnœa. By Mr. Solly's well-directed and persevering efforts, life was made to return. Sinapisms to the legs, the mechanical assistance of the diaphragm in expiration, &c., were the means used; and it was interesting to observe that, when the respirations recommenced, and especially as they became fuller and more numerous, warmth gradually returned to the previously ice-cold limbs, and the pulse again beat in the arteries. A more interesting and instructive spectacle could not have been witnessed. Recovery was complete.

Just as life was returning to this man, I witnessed exactly what Dr. Warren saw in one of his cases of air in the veins —"the livid colour of the cheeks giving place" (not steadily, but in sudden fits) "to a suffusion of vermilion red." The phenomenon in both cases was probably analogous to blushing, or was indeed mechanical blushing caused by the enlargement of the capillaries of the surface, and their sudden distension with *oxygenated* blood, in consequence of the asphyxia tending to cease from the return of respiration and the freer passage of the blood through the lungs.

CASE.

Red Cutaneous Suffusion—analogous to Blushing—not caused by Air in the Circulation.

Some months ago, I was called to treat a case of uterine hæmorrhage in which, immediately after delivery, an enormous quantity of blood was poured out within a few minutes, drenching the bed and flowing in streams upon the floor. There was prolonged syncope, alternating with short fits of catching and stertorous respiration, during which the countenance was at one moment ghastly pale, at another purple, and then at intervals suffused for an instant with a deep vermilion red, which was not confined to the face, but several times appeared in transient patches upon the neck and upper part of the thorax, which happened to be exposed. The uterus was ultimately made to contract, and the patient made a tolerable recovery. She is now well and nursing her infant. I think it likely that in this case air entered by the uterine sinuses; but, though at the moment I had the red cases of Drs. Warren and Simpson vividly in my mind, I was so impressed with what I had seen at St. Thomas's, as well as in another case of an entirely different character (which I then had and still have under treatment) that I adopted at the time the explanation I now give of the rapidly-changing colour of the surface. The ghastly countenance depended on spasmodic constriction of the capillaries—the purple and vermilion replaced the pallid hue when the spasm ceased and the capillaries suddenly became relaxed, the patches depending upon the whole exposed surface of capillary network not being equally and simultaneously affected with spasm, and the purple or red hue being determined by the goodness or badness of respiration at the moment. It is not improbable, as I have already admitted, that the impediment to the passage of the blood through the lungs in this case depended on the entrance of air by the uterine veins, and the presence of frothy blood in the branches of the pulmonary artery ; but still I think the vermilion patches cannot be explained by an affirmative answer to Dr. Simpson's question, *because a dangerous quantity of air introduced into the venous system, in place of oxygenating the blood, tends to cause a more or less complete state of asphyxia, by rendering the passage of the blood through the lungs difficult or impossible.* The tendency of the accident, even in its mildest forms, is to impede the exit of the blood from the right ventricle.

CASE.

Evanescent Red Cutaneous Suffusion depending probably on a Certain State of the Capillary Vessels.

I have at present a patient, the subject of ovarian and uterine disease, who on slight emotional causes, and sometimes without any obvious cause, falls into a state of trance or unconsciousness, the duration of the seizures lasting for minutes, or sometimes for many hours. The countenance is generally placid, though, on two or three occasions, there has been spasmodic affection of the muscles of the mouth and neck, and twice there have been violent convulsions of the extremities. However, on various occasions when I have been present, and on many more which have been described to me, the eyes have become suddenly fixed, the visage has been overspread with a deep blush, and a state of entire unconsciousness has commenced, from which no pinching could rouse her. I have often watched this condition, and have seen red patches appear suddenly on the surface, and have observed the face to become fitfully suffused with a delicate blush, superseded quickly by an extreme pallor; and these changes have generally indicated that the fit was likely soon to terminate. Dr. Henry Bennet once saw this case with me, and witnessed such an attack as I have described. In this patient, I have seen the evanescent red on the surface so precisely similar to what I saw in the lady with uterine hæmorrhage that I adopt in both cases the same explanation, and connect it with the condition of the capillary vessels.

The idea of the red hue in the cases of Warren and Simpson being dependent upon super-oxygenation of the blood is, I think, untenable. *The effect of introducing air into the circulation in sufficient quantity to cause inconvenience, is, beyond question, to prevent the adequate aëration of the blood.* The red hue is therefore no evidence, in any obstetric case, that air has entered the veins. The red appearance may possibly be seen in cases in which air has entered the veins; but still, it is a phenomenon depending upon a particular state of the nervous system induced by various causes, and giving rise to a capillary relaxation identical with the condition of the small vessels in blushing from emotional causes —a phenomenon which can have nothing to do with oxygenation of the blood by the air which has entered the veins.

PREVENTION AND TREATMENT OF ACCIDENTS ARISING FROM THE ENTRANCE OF AIR BY THE UTERINE VEINS AFTER PARTURITION.[1]

From the facts already stated, it is plain that the object of the treatment, both preventive and curative, is to promote natural and permanent contraction of the uterus after delivery. As it is extremely probable that loss of blood and the entrance of air in many cases conjointly cause death, it is satisfactory to feel assured that the proper treatment for the one is the best also for the other—so far as the one thing primarily essential is to endeavour to promote uterine contraction. Plugging will also be specially proper when there is convulsive contraction and expansion of the uterus, with or without much hæmorrhage; for then there exists the greatest tendency for the atmospheric air to enter the uterus and to be forced into the uterine veins.

If a large quantity of air have entered the circulation, unequivocal evidence of this having occurred will be found by listening to the heart, when the churning sound will be heard. If death does not almost at once close the scene, the phenomena of asphyxia will set in. Their rapidity and violence will depend upon the quantity of air which has entered; on its passing up to the heart in one large volume or in divided quantities; on the presence or absence of hæmorrhage; and on the strength of the patient. The distension of the right side of the heart, and the existing or impending asphyxia, must be met by an application of the general rules which I have given in my thesis and elsewhere, so far as they are consistent with the special circumstances of each case. In fact, there is no uniform routine practice which can be rationally recommended in this formidable class of cases. If the practitioner understand the nature of the accident, he will be able to adapt his remedial measures to the emergency. The special means adopted may vary infinitely—as in uterine hæmorrhage:—but the general principles of treatment are immutable and simple, and ought to be engraven in the mind of every accoucheur. The amount of success attending their application depends upon the promptness, the nerve, and the adaptive sagacity of the practitioner.

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[1] For suggestions in respect of treatment see also p. 109 of this volume.

Essex House, Putney;
September 1, 1850.

NOTE

ON

DR. GEORGE CORDWENT'S PAPER,

ENTITLED

"ON SUDDEN DEATH BY THE ENTRANCE OF AIR INTO THE UTERINE VEINS."

NOTE

ON

DR. CORDWENT'S PAPER ON THE ENTRANCE OF AIR INTO THE UTERINE VEINS.

While the preceding pages of this volume were passing through the press, I became acquainted with Dr. George Cordwent's paper in the Sixth Volume of the 'Saint George's Hospital Reports,' published in 1873, entitled :—"On Sudden Death by the Entrance of Air into the Uterine Veins." I extract *in extenso* the case which forms the basis of that interesting paper. In Dr. Cordwent's case death must be attributed to some other cause than the entrance of air into the circulation. At all events, if the principal facts and arguments contained in the previous pages of this volume are accepted as reliable and sound, Dr. Cordwent *has not proved the cause of death* by his description of the symptoms during life and the appearances found at the autopsy, to have been the entrance of air into the uterine veins.

Cordwent's Case.—*Sudden Death after Parturition: Autopsy twenty-four hours after Death.*

"In 1857, Mrs. W—, æt. 28, wife of a farmer near Taunton, had proceeded favorably to the full period of gestation; health and personal figure were, and had been always especially good—in fact, every condition seemed favorable to parturition—to that normal function of female life which Nature is markedly solicitous of safely guiding; but this young and vigorous woman died suddenly, and in the following circumstances: Soon after the despatch of the messenger to me, expulsive pains became urgent, and at the request of the patient she was permitted to remain standing; after a few severe pains a fine male child, still living, was expelled, and falling to the floor dragged with it the whole placenta. Almost immediately a kind of gurgling was heard by the attendants, but whether that arose from rumbling in the bowels they could not say. The patient remained during about a minute standing as before, and holding the bed-post. She then said, 'I can't see! I feel faint! Lay me on the bed!' Her request was obeyed; and she instantly died. I arrived a few minutes after. The countenance was calm; its expression, and the pose of the whole figure, were those of natural sleep: there had been no convulsive movement. Of course the question now comes forcibly:—What caused death to this young and vigorous life? The essence of pathological teaching is, that death can only occur by a chemical or physical force, which in its gradual or sudden application is sufficient to overcome the resistance of life-force.

"Twenty-four hours after death, I made a careful examination of the viscera of the pelvis, abdomen, and chest. The uterus externally had the appearance attributable to recent child-birth, except that a portion of the wall of its fundus, to about the extent of a five-shilling piece, was slightly more puffy than the other portions; and on cutting into it air-bubbles escaped. There had been no laceration of the placental surface: the uterine cavity contained only one small clot: its lining membrane was healthy: the viscera throughout the body were healthy and well arranged: but on looking at the stomach, the key to death was at once evinced—its coronary vein was tensely distended by air: it was empty of blood, except a fine thread which lay along its attached border: the right side of the heart was slightly gorged, and when the auricle was punctured, air-bubbles escaped from its contained blood. This last observation is fairly open to criticism, because the opening made admitted air; and *for proof*, the opening should have been made under water, or other non-aërated fluid: but my impression was, and is, that previously contained air escaped. I need not repeat that the structures of the heart and lungs were healthy."

The symptoms during life and the *post-mortem* appearances in this case were different from those which have specially characterised unquestionable cases of sudden death from the entrance of air into the circulation. When an animal is suddenly or very rapidly killed by the admission of air into a vein; or when, in the human subject, sudden or rapid death takes place under analogous conditions, the fatal catastrophe is ushered in by convulsions, and on examination of the heart after death, the right auricle is found distended—generally enormously distended—with air and frothy blood. Air may have entered the uterine veins of Dr. Cordwent's patient during life: but the fact that such an event occurred is insufficient to prove that it occasioned death.

Perhaps the most reasonable explanation of the sudden death of this patient is one which Dr. Cordwent considered and rejected—viz. "loss of support to the organs of circulation." In general medical practice, as well as in, or perhaps oftener than in, midwifery, sudden withdrawal of support from the large veins of the abdomen and pelvis is a cause of death—a too common because a generally avoidable cause of death. I have an intimate circumstantial acquaintance with several cases in which patients died suddenly—and unnecessarily—during convalescence from typhoid fever and other exhausting diseases, simply because an abundant alvine evacuation took place in the sitting and not in the recumbent position. My attention was painfully directed to this subject by two deaths which occurred in the Fever Hospital of Edinburgh during the period of my physicianship.[1] Since that time it has been my habit—my invariable routine—earnestly to caution nurses and others in attendance upon cases recovering from protracted and exhausting diseases, or in whom from any cause the heart's action is feeble, to be specially watchful of the patients when the bowels are being relieved, and as much as possible to enforce a maintenance of the recumbent position during defecation. When from neglect of necessary precautions, or from any cause, known or unknown, there is impending or actual cardiac syncope in this class of patients, an immediately favorable result is generally obtained by placing the body in the horizontal position and raising the legs above the level of the pelvis. The firm girding of the abdomen by means of a broad bandage is another measure of great efficacy which ought never to be neglected in such cases. This girding is equally valuable as a means of preventing such attacks in persons predisposed to them, and of determining a favorable issue when they do occur.

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[1] See page 68 of Volume I.

CASE.

Habitual Cardiac Syncope from Unloading the Bowels at long Intervals—Successfully Treated by Firmly Girding the Abdominal Walls during and for half an hour after Defecation.

I was consulted some years ago by an anæmic lady, for constipation and other associated inconveniences and discomforts. She was so afraid of fainting when the bowels were moved, that through the very dread of this occurrence she was in the habit of allowing five, six, or even seven days to elapse before using the laxatives and enemata to which she knew it would be ultimately necessary for her to resort. She explained her irrational conduct in this matter by informing me that she generally either fainted or nearly fainted when her bowels were unloaded after the customary interval of some days. I advised her to wear a broad flannel girdle round her abdomen, to be tightened strongly during and for half an hour after defecation. She acted on my advice; and suffered no more from fainting or fear of fainting at stool.

In this case the tendency to cardiac syncope was clearly caused by the sudden withdrawal of the support afforded by the loaded colon to the organs of circulation; and the prevention of cardiac syncope was obtained by supplying, when necessary, the support of the abdominal belt.

On my first perusal of Dr. Cordwent's paper, the case about to be related—which had then very recently occurred—was immediately brought to my recollection as an instructive illustration of the way in which life is endangered by failure of the heart through the rapid withdrawal from the veins of the support of the gravid uterus. I asked myself then, and I repeat the question now :—Are not the two cases essentially similar in respect to the element of danger in the one case, and to the cause of death in the other?

CASE.

Sudden Cardiac Syncope at the Sixth Month of Pregnancy from Collapse of the Abdominal Bulk caused by a Rapid Discharge of the Liquor Amnii—Successfully Treated by Firmly Girding the Abdominal Walls.

During the evening of August 25th, 1874, I was summoned to a lady, who, I was told, had become suddenly very unwell. I was with her in about an hour from the time at which her illness had attracted attention. She had been occupied the greater part of the day in Parisian sightseeing with a party of ladies and gentlemen. She returned to her hotel considerably fatigued. She was, however, in good spirits, and relinquished, not without hesitation, her intention of joining the general dinner party. Immediately on retiring to her own room with a lady-friend, she was suddenly seized with giddiness and a tendency to faint. She sat down on a sofa and immediately afterwards began to vomit. At the same time she perceived a gushing discharge from the vulva, and in thick speech called the attention of her friend to that circumstance and to her general condition as that of rapidly approaching death. I was then sent for. Between the departure of the messenger and my arrival, she had become much worse. There had been copious vomiting, followed by deadly pallor, clenching of the teeth, and a state described to me as unconsciousness; but which was afterwards proved by the patient's narrative of all that had taken place, to have been a condition in which there existed utter prostration and loss of speech, with perfect consciousness of all that was being said and done. Attempts to swallow some hot brandy and water brought on a renewal of the vomiting. On my arrival she was nearly pulseless—lying on a bed with her clothes partially loosened.

In reply to my questions she said, in a very low and yet very distinct whisper, "I am in the sixth month of pregnancy; I never was so large as this time; I am dying, I am flooding." Her bulk, it appeared, had suddenly collapsed, and the liquor amnii had poured forth so abundantly as to soak through the bedding to the floor. There was no coloured discharge, and no stain of blood was anywhere visible. The os uteri was not sufficiently dilated to admit the point of the finger. No movements of the fœtus could be detected. On removing the corsage to complete the undressing, she suddenly became deadly faint, and for a few seconds seemed to be dead. Within a minute or two I had the abdomen tightly and evenly girded with a bandage formed of two towels. The beneficial result of this measure was seen at once by a return of the pulse. Next day, when I spoke of the good which had been produced by binding the abdomen, she said with great earnestness that she had felt whilst the bandage was being tightened that her lost life was being put back into her. It had really seemed to me as if it were so. The legs were at the same time raised, and with all possible speed turpentine stupes were applied to the lower and upper extremities, both of which were icy cold. The pulse, however, was returning before the stimulating warmth was applied *externally*, and before she had begun to take hot beef tea and brandy in teaspoonfuls at short intervals.

In five days this lady had nearly regained her former abdominal bulk, was able to sit up, and felt so secure and comfortable, that I allowed her, in charge of an experienced nurse, to return to her home in London. She accomplished the journey very satisfactorily. Exactly a month from the date of the alarming swooning attack, she brought forth a premature, exceedingly small, feeble child. Soon after her confinement, she was restored to her former life of health and activity.

From a study of the cases now mentioned and of many others I have met with, more or less similar in their nature, I believe that Dr. Cordwent's patient died from the sudden withdrawal of the accustomed support of the large veins by the uterine tumour. At all events, this appears a more probable explanation of the death than the entrance of air by the uterine veins. It is quite possible that some air may have entered the veins during life or after death; but there is no proof that air was the cause of death. This topic has already been discussed in previous articles in this volume, particularly in the critical examination of a case of suicide published by Dr. P. D. Handyside.

The causes of most of the unexpected sudden deaths which occur some days after delivery, when all seems to be going on well, are embolism and fibrinous formations in the organs of circulation. In the puerperal state—as also in some diseases—the blood has a tendency during life to coagulate in the heart and large vessels. This tendency does not depend upon an excess of fibrin in the blood, but upon a condition (induced by different causes) which determines an abnormal clumping or aggregation of the red corpuscles.

II.

REFLEX CONVULSIONS OF INFANCY.

In early infancy—particularly during the period of dentition—general convulsions and spasmodic closure of the glottis are of frequent occurrence. These affections are generally of reflex origin, and can be usually traced to particular sources of irritation of the nervous peripheries. When an attack is present or threatened, the indications of treatment are to remove the cause of irritation, to relax muscular contraction, and to obtund nervous susceptibility. To prevent attacks, all available means must be employed to improve the standard of general health.

In practice, it is of the utmost importance to remember that Infantile Glotto-Laryngeal Spasm, though often catarrhal in its onset and always catarrhal in its immediate sequel, is (like whooping-cough) essentially a neurosis. It is equally important to bear in mind that it is one of the convulsive disorders which pertain to the period of dentition, and often has its origin, directly or indirectly, in the nervous disturbance incident to that process. I have treated or been concerned in the treatment of hundreds of cases of that form of Infantile Convulsion which is perhaps more appropriately designated by Glotto-Laryngeal Spasm than by any other of its many aliases:—and they nearly all occurred in children under three years of age.

I. REMARKS ON THE TREATMENT OF INFANTILE CONVULSIONS OF REFLEX ORIGIN: ILLUSTRATED BY A CASE IN WHICH A CHILD WAS

RESTORED FROM A STATE OF APPARENT DEATH BY THE HYPODERMIC INJECTION OF MORPHIA. [*From Medical Times and Gazette for* 21*st November*, 1874.]

II. INFANTILE GLOTTO-LARYNGEAL SPASM: [FREQUENTLY DESIGNATED SPASMODIC, SPURIOUS, OR FALSE CROUP]: ITS NATURE, CAUSES, COMPLICATIONS, SEQUELÆ, AND TREATMENT.

REMARKS

ON THE

TREATMENT OF INFANTILE CONVULSIONS
OF REFLEX ORIGIN:

ILLUSTRATED BY A

CASE

IN WHICH A CHILD WAS RESTORED FROM A STATE
OF APPARENT DEATH BY THE HYPODERMIC
INJECTION OF MORPHIA.

TREATMENT OF INFANTILE CONVULSIONS OF REFLEX ORIGIN.

CASE IN WHICH A CHILD WAS RESTORED FROM A STATE OF APPARENT DEATH BY THE HYPODERMIC INJECTION OF MORPHIA.

HENRY J. B., a handsome, sprightly, blue-eyed American boy, completed his seventh year on January 28th, 1874,—rather more, therefore, than seven months before September 20th, the date of the attack about to be described. I became acquainted with him in February, 1874, when I attended him for a slight catarrhal affection. During that and the following month I saw him frequently, not, however, as a patient, but from my being during that period in attendance on his father, then passing through a very formidable attack of pneumonia. At that time, the child did not seem robust; he was evidently of a highly nervous and excitable temperament: but still he had every indication of being playful, joyous, and in good health. From conversations with his mother in reference to him, I took particular notice of his physical and psychical state. She was under the impression that his mental were very much in excess of his bodily powers. Under that conviction, she had consulted a physician on the subject, and by his advice the boy's studies had been judiciously retarded. The mother, in mentioning these circumstances, likewise gave me his whole medical history from his birth. It contained several noteworthy facts. Twice he was supposed to have been very near death—once from scarlatina and once from dysentery. She mentioned another fact which also remained on my mind—vïz., that a few months before I first saw him, he had been attended by Dr. J. B. Allan, of London, in a slight illness, during which he had passed a round worm after taking a dose of castor oil. His recoveries from both scarlatina and dysentery were complete, there being in neither case lingering convalescence or morbid sequelæ.

I had not seen H. J. B. since March, nor had I heard anything of him since that date (when the family left Paris) till Sunday, September 20th, when I was summoned in haste to his assistance. The message reached my house about 2 p.m. I was absent: but was soon found. When I arrived, at twenty minutes to three o'clock, I found that three physicians, Drs. Belvin, Krishaber, and Lancereaux, had reached the patient before me. As I passed through an ante-room, I was told by a servant that the child was already dead; and, as I entered the chamber where the patient lay, the distracted mother rushed towards me, imploring me to declare the truth by saying whether her son were dead or not dead. I replied, "He has ceased to breathe." This was the exact truth: he lay apparently dead.

Before proceeding with the sequel of the history, it is necessary to give an account of the case from its commencement up to my arrival. This account I drew up on the night of September 20th, when everything told me by the parents, the nurse, and my colleagues, was fresh in my mind. I have since collated my account with a memorandum written by Dr. Lancereaux, also on the night of September 20th, so that I am as certain of the minute accuracy of the account of that part of the case which I did not see, as of that in which I was a participator.

Between 8 and 9 a.m. the child had breakfasted very much as usual, perhaps with a little less than his ordinary appetite, a circumstance naturally attributed to his not having quite slept off the fatigue of travelling. He had arrived in Paris on the previous day from Geneva, having performed the journey without a break. About eleven o'clock, he walked with his nurse from their residence in the Place Vendôme to the neighbouring church of Saint Roch. During the service, he several times complained to his nurse of feeling a pain in the left side, under the false ribs. This complaint was not urgent: it had been made several times during the eight or ten previous days, and had never seemed to be more than a transient discomfort. On his way home from church, the child seemed well and cheerful. When he sat down to dinner, at half-past one, with his little sister and nurse, there was nothing unusual in his appearance or manner.

He began to eat the meat and potatoes placed before him. The nurse saw him chew and swallow the first few mouthfuls in a perfectly natural and ordinary way. When looking at him, she observed that a mouthful was either imperfectly received by the mouth, or, after being received, that it fell from it. The potatoes fell down on his plate—more, as it appeared, through carelessness on the part of the child than from any other cause. At the same time that this circumstance was attracting the attention of the nurse, she observed that his head turned towards the window, and that his eyes became fixed as if he were eagerly looking at a particular object. At first—but only for an instant—she fancied that something at the window had suddenly arrested his attention. In a minute, or perhaps even within less, she observed that his eyeballs were in spasmodic movement, the muscles of the face twitching, the neck rigid, and the head unnaturally bent backwards. In another minute or two, there was a clenched state of the jaws and a foamy sanguinolent flow from the dental interstices. Before five minutes had elapsed from the time when first the eyes moved spasmodically and the neck became rigid, there existed formidable epileptiform convulsions with suffocative paroxysms. Consternation and anguish seized the family. The child was undressed and placed in a hot bath. A messenger was sent to fetch me; and in quick succession other messengers were despatched in search of other physicians. Drs. Belvin and Krishaber arrived soon after two o'clock, so that very little time elapsed between the seizure and the institution of suitable treatment. At about a quarter-past two, Drs. Belvin and Krishaber were joined by Dr. Lancereaux. He found the patient lying undressed on a bed, near a half-open casement window; the legs were wrapped up in hot moist flannel. As Dr. Lancereaux entered, Dr. Belvin was endeavouring to separate the spasmodically clenched jaws: the extreme rigidity of the muscular contraction rendered it impossible to open the mouth. Seeing that the neck was turgid, that there were no convulsive movements, that the paleness of death was on the face, and that respiration had ceased, Dr. Lancereaux's first, though fleeting, impression was that the child was either on the very brink of death or had already died from diphtheritic croup. He immediately, however, took another view of the case when he was told that the child had breakfasted, had walked to and from church, and had been sitting at dinner in apparently his usual health, when he was suddenly attacked with convulsions. He came to the conclusion that the convulsions were of a reflex character. The pupils were dilated when Dr. Lancereaux examined them a minute or two after his arrival. The face and legs were slapped. Cold water was dashed over the face. All the usual means were tried to make the child inspire, particularly the excitation of the fifth pair of nerves. Artificial respiration was then commenced, and was perseveringly continued. At the end of a period estimated to be about ten minutes or a quarter of an hour, respiration was re-established; and the death-like paleness disappeared. Just as these favorable signs had given some hope of recovery, a new convulsive attack threw the patient back into the former death-like state. Artificial respiration was again practised, and again the result was highly beneficial. Again, also, a new convulsive attack supervened. It was in this crisis of hopes and fears that Dr. Lancereaux proposed the hypodermic injection of the hydrochlorate of morphia. The proposal was accepted by Drs. Belvin and Krishaber. As the pharmacy of M. Gallois is immediately opposite the house in which the scene I am now describing occurred, two or three minutes sufficed to procure the solution and injecting apparatus. About seven milligrammes of the hydrochlorate of morphia were injected into the areolar tissue of the thigh. In a minute or two after the injection the child became more violently convulsed than he had yet been; the diaphragm, in particular, became the seat of most formidable spasms. These severe convulsions were followed by a return to the former death-like state. Then it was that I arrived.

I have already mentioned that when I entered—about twenty minutes to three—the mother was in doubt as to whether her son were dead or living. Just as I approached the bed on which he lay, apparently dead, two of the physicians were resuming the performance of artificial respiration, and a third was arranging his tracheotomy instruments. I was quickly informed by my colleagues what had occurred before and since their arrival. Whilst our consultation proceeded, the performance of artificial respiration was unremittingly continued. For a minute or two after my arrival the patient looked exactly like a child which had succumbed to diphtheritic suffocation. The face was bluish; the throat was turgid; there was no pulse; and, except the artificial movements of respiration, there were no movements. Very soon, however, the muscles of the neck manifested slight spasmodic twitchings, and the eyeballs were several times seen to veer rapidly about and upwards. No pulse could be felt; then, an extremely slight pulsation was detected over the heart and at the radial artery. There still seemed some hope, and that hope was increased by my declaring my conviction, based on my previous knowledge of the patient, that the convulsions and suspension of the necessary motions of respiration depended upon intestinal tickling by lumbrici. Dr. Lancereaux proposed that an additional dose of the hydrochlorate of morphia should be injected into the areolar tissue, justly remarking at the same time that the probable cause of the failure of the first injection was that the quantity injected fell short of the requirement. We all agreed that there should be a second injection. The quantity of hydrochlorate injected on the second occasion was five or six milligrammes. The total quantity of hydrochlorate of morphia injected was thirteen milligrammes. About a minute before the performance of the second injection, an ounce and a half of turpentine mixed with a little olive oil was, at my suggestion, thrown into the rectum. By exciting the intestinal tract of the pneumogastric nerve, I imagined that by reflex action we might obtain respiratory muscular movements, while at the same time we might possibly get rid of the origin of the evil by causing the supposed offending lumbrici to be expelled. I cannot say whether this measure exercised any beneficial influence on the progress of events. I record the fact of its having been employed, as its omission would render the history incomplete, and also because, under somewhat similar circumstances, I have seen a happy issue to follow, and, as I believe, to result from removing irritating matter from the bowels and from stimulation of the intestinal tract by turpentine.

The terebinthinate enema was not followed by any alvine evacuation; and, indeed, twelve or thirteen hours elapsed after its administration before the child had a stool. In respect to the beneficial effect of the second injection of hydrochlorate of morphia, none of the physicians who were present entertained the slightest doubt. We all felt that it was a physiologico-therapeutical demonstration of very rare and surpassing beauty, although we were not insensible to the probability of the convulsions having to a great extent spontaneously exhausted their violence when the second injection was made. Irrespective of all treatment, such attacks, it is well known, have a natural tendency to cease.

Within less than three minutes from the time at which the second dose of hydrochlorate of morphia was injected, it was evident that there was a gentle heaving of the thoracic walls—a natural play of the diaphragm and abdominal muscles. Air was entering the chest. The blue appearance of the countenance quickly vanished. The child rapidly passed into a state of profound and very tranquil narcotism; and as he did so the lungs became better and better expanded with each inspiration, till (within a very few minutes) the pulse and respiration were fairly good and almost regular. The only interruptions to perfect regularity in the breathing arose from the occurrence of a few slight occasional spasms of the diaphragm during about a quarter of an hour.

A little before four o'clock my three colleagues retired, and I remained with the patient. The excitement of the scene and the extreme tension of anxiety had then subsided; though of course there were still remaining some causes of solicitude. At four o'clock I counted the pulse and respiration: the former was 124, and the latter was 30. The patient was then in a very tranquil and profound sleep: the skin was warm and a little moist. With the mother and the nurse sitting with me beside the patient, I took out my note-book, and jotted down all they told me of the occurrences of the day before and after the seizure. Till a quarter to five the child made no movement: the respiration was quite regular, easy, and noiseless: the face was slightly flushed. At this time I observed occasional slight twitchings of the muscles of the face and neck. After five o'clock I never noticed the slightest twitch or spasm, and till seven I did not leave the child except for two or three minutes, about six o'clock, when Dr. Lancereaux returned by appointment to renew our consultation. At five o'clock there was no recognisable diminution in the profoundness of the narcotism. The skin was everywhere covered with a profuse sweat; the pulse was 112, and the respiration 28. At half-past five the child scratched his chest and abdomen, and turned half round from his back to his left side. For the next half hour he did not move in the least degree. At six o'clock, Dr. Lancereaux on entering, put his cool hand on the chest; the child then quite turned round on his right side, and scratched his chest, abdomen, and arms. He was still asleep, but was evidently passing out of the narcosis. I remained with him till seven, when I left him sleeping. Being obliged to be absent for at least two hours, and as the family could not bear the idea of being without immediate help in the event of some unforeseen emergency arising, my son, Mr. Baillie Cormack took my place. I returned about nine o'clock. The patient was then drowsily awake and in a state of placid repose. His general condition and very contracted pupils showed that he was still under the powerful influence of the morphia. He asked for water, and complained of thirst even after taking repeated draughts. As I entered the room on my return, he fixed his eyes on me, and when asked my name, at once mentioned it. He was still very drowsy when Dr. Lancereaux again met me in consultation at ten o'clock. We agreed that probably for the time being all danger was past, and that in a day or two it would be expedient to administer a vermifuge.

In compliance with the request of the child's father and mother, I remained in the house during the night. Soon after eleven o'clock the child complained of headache, became restless, and very talkative. He had a good deal of nausea, and could not be persuaded to take food. The restlessness and talkativeness went on increasing, and though his excited incoherent talking was only an exaggeration of his natural manner, it amounted in reality to something closely approaching delirium. He took some beef-tea at midnight, and afterwards seemed to become a little quieter. I then retired to rest. I was summoned about two o'clock, the nurse having become alarmed at his increasing restlessness and seemingly delirious excitement. I then prescribed five grains of bromide of potassium in syrup of orange, to be given every hour till further orders. He became gradually quiet; but when I saw him at seven in the morning he had not yet fallen asleep. He was still suffering from nausea and excessive perspiration. He had taken altogether four doses—that is, a scruple—of the bromide. He fell asleep about eight o'clock and woke in two hours refreshed. He passed a good day in bed without nausea or perspiration, taking a fair amount of nutriment in the form of milk, panado, and beef-tea thickened with tapioca.

Next morning (Tuesday) at ten o'clock, he took a grain and a half of santonin and three grains of calomel. At noon he passed a lumbricus twelve inches in length, and at one o'clock a second, measuring six inches, together with three somewhat shorter and of less circumference.

The action of the vermifuge powder made the child very sick; but the nausea and sickness passed away almost immediately after he had taken a little hot brandy and water.

On Wednesday, the fourth day after the attack, I found him perfectly restored to health. He was from that day allowed to resume his ordinary routine of diet, exercise, and amusement. In consequence of neuralgic intercostal pains and a somewhat anæmic appearance, he has taken from that date till now (24th October, 1874) small daily doses of the British tincture of the chloride of iron, and he has greatly improved in colour under the influence of that medication.

Trousseau, in a clinical lecture on scarlatina, incidentally refers to delirium and other nervous symptoms, irrespective of any toxic or septic cause, being produced by mere tickling. He refers to cases in which persons have caused women to die by tickling the soles of their feet. The victims are described as becoming exhausted, and falling into a state of violent delirium, accompanied by extraordinary nervous phenomena. Trousseau goes on to state that an unnatural excitement of the sensibility due to reflex action is equally liable to occur in the nervous apparatus of organic life. "It is thus," he says, "that we can explain certain formidable symptoms in children, such as delirium, convulsions, paralysis, and loss of vision, caused by the presence of intestinal worms, even when the worms occasion no decided pains in the abdominal viscera. In these cases cerebral hyperæmia plays no part."[1]

In the case of H. J. B. the nervous phenomena were clearly caused by the reflex excitement of the cerebro-spinal system, caused by lumbrici "tickling" the intestinal tract of the pneumogastric nerve.

It is to Marshall Hall that we are mainly indebted for the correct pathology of such and such-like cases. He it was who first demonstrated that paralysis, convulsions, and other nervous affections may be caused by reflex cerebro-spinal irritation. He showed that the irritation of teething, through the trifacial tract, produces spasm of the glottis and general convulsions; and also how similar phenomena may result from irritation of the gastro-intestinal tract, through the pneumogastric nerve, by improper food, overfeeding, diarrhœa, constipation, or the presence of worms.

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[1] TROUSSEAU;—"Clinique Médicale de l'Hôtel-Dieu de Paris," tome premier, p. 134, édition 3me. Paris, 1868. See, also, my translation of Trousseau's "Clinical Medicine" for the New Sydenham Society, vol. ii, p. 205. London, *1869.*

The case of H. J. B. affords an instructive clinical study in illustration of this subject, both in respect of pathology and practice. The epileptiform convulsions and the suspension of the motions of respiration were clearly caused by lumbrici tickling the intestinal nervous tract. In this case life was all but extinguished by the action on the spinal cord influencing the motions of respiration through the intercostal and diaphragmatic nerves. Though no crowing or whistling sound was at any time heard, it is very probable that the chink of the glottis was closed for a time by the spasmodic contraction of the constrictor muscles of the larynx, influenced through the inferior—that is, the recurrent—laryngeal nerve, from which nerve, as Dr. John Reid has experimentally proved, the constrictors derive their motor power. He has also shown by his admirably contrived and carefully conducted experiments that nearly all the movements of the larynx are regulated by the inferior laryngeal nerve.[2]

The great clinical interest of this case in respect of treatment belongs to the large amount of hydrochlorate of morphia which was hypodermically injected, and the signal success which attended the practice. Thirteen milligrammes —the fifth part of a British grain—is a large dose of the salt to be injected into the areolar tissue of a boy seven years of age. For this reason I have been careful to describe with minuteness the exact condition of the patient before, at, and after the hypodermic injection. The result of the experiment made in the case of H. J. B. militates against the opinion of Dr. Charles West, of London, so far as a single case can be allowed to weigh against a conclusion arrived at by one of the most experienced and accomplished physicians of the day. Dr. West says :—"The subcutaneous injection of morphia is an excellent means of obtaining relief from intense pain, which once or twice I have had recourse to. It is, however, hazardous in early childhood, and the few instances in which it is likely to be needed will be met with in surgical rather than in medical practice."[1]

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[2] Reid (John):—"Physiological, Anatomical, and Pathological Researches. No. IV.: Experimental Investigation into the Functions of the Eighth Pair of Nerves, or the Glosso-Pharyngeal, Pneumogastric, and Spinal Accessory," p. 61 *et seq.* Edinburgh, 1848. Dr. Reid's experiments first appeared in 1838 in the *Edinburgh Medical and Surgical Journal.* To my dear departed friend the merit belongs of having shown by an admirable series of experiments on animals that the inferior laryngeal or recurrent nerve is an *efferent* or motor, and the superior an *afferent* or incident nerve.

From the case now under consideration, we learn that cases do occur in which a large dose of the hydrochlorate of morphia may be injected into the areolar tissue of a child, apparently with signal benefit, and unquestionably without producing any evil consequences. In the convulsive attacks of children there is always a possibility that recovery is not at all due, or is only due in a very limited degree, to the therapeutic measures which have been adopted. All such attacks cease spontaneously; and it is sometimes exceedingly difficult to say how much in the causation we are to impute to the fit having attained its normal period of termination, and how much is due to our active measures. Fully realising this difficulty in the clinical study of infantile convulsions of reflex origin, I have been careful to state the facts very minutely and exactly as they occurred, even at the risk of being somewhat tedious, so that my readers may, after weighing the whole of the facts for themselves, accept or reject my interpretation of them.

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[1] WEST (Charles) :—"Diseases of Infancy and Childhood," p. 22, sixth edition. London, 1874.

The great advantages of adopting the hypodermic method of administering morphia in infantile convulsions are the *certainty and celerity with which anti-spasmodic action is obtained.* There is an almost immediate result; no time is lost. In such a case as that of H. J. B., time is everything. Since the hypodermic injection of the salts of morphia in neuralgia has been in common use, practitioners have become familiar with the fact that relief from the most excruciating neuralgic pain is often obtained within two or three minutes after the injection. In the adult, in cases of spasmodic asthma, quite as decidedly as in neuralgia and other painful affections, the suitability of the drug, and the superiority of the hypodermic mode of administering it, I have for some time past fully recognised, in common with several of my friends. I have never yet employed hypodermic injections of morphia in young children. From what I saw in the case of H. J. B., I should not, however, hesitate to employ it in a similar case, and also in some *dangerously severe* cases of spasmodic croup (the *faux croup* of the French) which occasionally, though not frequently, present themselves. The stridulous breathing in false croup is much more alarming to mothers than to doctors; and as the cases are rare in which life is endangered by a paroxysm of that disease, the cases must be very exceptional in which the hypodermic injection of the hydrochlorate of morphia need be resorted to. I have, however, more than once seen death occur in false croup from excessive prolongation of the spasmodic paroxysm; and when next a threatening case presents itself, I shall probably recommend the hypodermic use of morphia as the most likely means of averting death.

The quantity of hydrochlorate of morphia which can be safely injected into the areolar tissue of children I am unable to estimate from my own experience or from inquiries addressed by me to several friends in large practice. The subject requires the careful clinical study of several competent and careful observers possessed of the necessary time and opportunities. The facts as well as the inferences in an experimental inquiry of such a kind must be the result of the reporting-physician's own seeing, and not in any degree —if it can be helped—of the reports and conclusions of mothers, relations, and attendants. A few cases, patiently and minutely observed, and faithfully described, will throw more light on this delicate subject than a magazine of statistics gathered indiscriminately from good and bad fields; for crude medical statistics are always valueless and they are dangerously misleading in the hour of emergency at the bedside.

No remedies are more generally useful than opiates in the preventive and curative treatment of the ordinary reflex convulsions of dentition, in which class of cases the fits depend upon irritation of the trifacial nerve. It frequently happens, however, that when the child is actually convulsed it cannot swallow. Under such circumstances it is usual to give the opiate in the form of an enema. If the hypodermic method of employing hydrochlorate of morphia can be formulated for safe use in the treatment of convulsions in children, it is obviously preferable on account of its much greater certainty and rapidity of effect.

PARIS; *October*, 1874.

POSTSCRIPT.

On the evening of the 18th August, 1875, when absent in the north of Scotland, the following telegram, dated 4½ p.m., from the father of H. J. B., reached my house in Paris from an hotel in Dieppe:—"*Harry has another attack similar to the one in Paris. Come to us at once. Reply.*" In acknowledgment of the message announcing my absence, a second telegram, dated 10 p.m., was received in Paris to the following effect:—"*Convalescent. Attack much less severe than one in Paris.*" A few days later I received a long letter from the mother containing the following passage:—"I can hardly tell you how great a shock I have suffered from his second attack, for he never looked better, and seemed in the most perfect health. He was seized as suddenly as in Paris. It seemed an age before any doctor arrived. All at once we remembered the morphia: but I had some difficulty in persuading them to use it. At last Dr. Lallemand yielded to my wishes, and then the spasms ceased. Harry fell asleep, and woke quite himself. This attack perhaps lasted as long as the first, but it was very much less severe, and its after-effects were very slight. Dr. Lallemand says he never was in any danger. He gave him a vermifuge without result, also santonin according to your prescription of last year. He is now taking bromure de potassium. We will bring him to see you next week. In the mean time, he seems quite well."

The following is a translation of a complete account of the attack given by Dr. Lallemand in a letter to me dated 30th August:—

"I found the patient with his eyes half open and in a state of complete unconsciousness. Convulsive attacks succeeded one another at intervals of about ten minutes; and, strange to say, the spasmodic affection did not always occur in the same region of the body. At one time, it was the right side of the face, at another the left side of the face, and at another the entire facial region which was convulsed. The pupils varied very much, being sometimes dilated, and at other times contracted: occasionally, there was slight strabismus. During the latter fits, there was some foaming at the mouth. As I took the precaution of introducing a piece of cork between the upper and lower teeth, the little patient scarcely bit his tongue, and consequently the mouth-foam was very slightly sanguinolent. Sometimes, the respiration became slow, but it never ceased, nor was there ever any threatening of suffocation. During the convulsions, the hand was clenched and the thumb flexed on the palm of the hand. The body and limbs did not participate in the convulsions. The pulse remained good throughout the attack.

"I was never much alarmed as to the issue of the case. The only circumstance which made me anxious was the long duration of the attack, it having continued from three to five o'clock. At the express request of Mrs. B. [*sur le désir formellement exprimé par Madame B.*] I twice made a hypodermic injection, by the syringe of Pravaz, of a solution of the hydrochlorate of morphia introducing each time five drops which represented exactly 0·01 Centigr. of the hydrochlorate. Very soon after the second injection, the little patient scratched himself violently everywhere, and then fell into a tranquil sleep of some hours, which was only disturbed occasionally by some twitchings of the limbs. On waking, he seemed surprised at his surroundings, and seemed to manifest the existence of slight delirium. He soon again fell into a sound, calm sleep. Next day he was free from excitement, and very nearly in his usual state.

"As he had passed lumbrici after his last year's attack of convulsions, I hoped that the eclampsia which I had witnessed might be of the same nature. I therefore administered on the day after the attack a powder of semen-contra followed by a dose of castor oil. Two days later, he had the santonine as formerly prescribed by you. No lumbrici were passed. I then decided to treat the patient with extract of valerian and bromide of potassium, the medicines he is now taking."

I saw the patient in Paris on the 7th, 8th, and 9th September. He was plump; and in all respects seemed in a wholesome state—eating, drinking, sleeping, and romping exactly like a healthy boy of his age. During his stay in Paris, he took a mixture of valerian and bromide of potassium prescribed for him by Dr. Lallemand.

I recommended that this medication should be continued till such time after his return to Dieppe as Dr. Lallemand might advise, and that another trial for lumbrici should be made, under that physician's observation, with a vermifuge which had not yet been employed in this case—the bristles of the *mucuna pruriens*. As a general rule, no medicine is so efficacious as santonine in dislodging lumbrici; but still, from time to time, cases occur in which, after it has failed, a successful result is at once obtained by cowhage. By my advice, therefore it was given prescribed thus in the usual way:—

℞ Spic. mucunæ prurientis, ʒij;
Syrupi, ʒiv. Misce.

One third of this electuary to be taken early on three successive mornings; and two hours after the last dose, a tablespoonful of castor oil.

During and after this medication, the child's stools were carefully examined, but neither lumbrici nor anything abnormal could be discovered in them.

On the 21st September, when I last heard of this patient, he was reported by his mother to be in perfect health, and to have discontinued all treatment.

I would remark in respect of there having been no lumbrici observed in the stools, that it does not follow that none were passed, or that the Dieppe attack was of central origin.

During the ten months which have elapsed since the publication of the case of H. J. B. in the *Medical Times and Gazette* I have not met with any case in early childhood in which the hypodermic injection of morphia was indicated. I am, however, fully prepared to fulfil the indication at a moment's notice. Thanks to Dr. Ernest Sansom of London, it is now very easy to be always fully prepared to administer hypodermically, the various medicines ordinarily so employed. In addition to the little syringe—which conveniently takes its place in the waistcoat pocket beside the clinical thermometer—all that is required is to add to the furnishings of the ordinary professional pocket-book the small packet of "discs" so elegantly prepared by Savory and Moore, and which can be had at a small cost in London, Paris and most of the principal towns at home and abroad.

PARIS: *1st October*, 1875.

INFANTILE GLOTTO-LARYNGEAL SPASM:

FREQUENTLY DESIGNATED

SPASMODIC, SPURIOUS, OR FALSE CROUP:

ITS

NATURE, CAUSES, COMPLICATIONS, CONSEQUENCES,

AND TREATMENT.

INFANTILE GLOTTO-LARYNGEAL SPASM:

ITS NATURE, CAUSES, COMPLICATIONS, SEQUELÆ, AND TREATMENT.

In the *Medical Times and Gazette* of 21st November, 1874, I made some remarks on the "Treatment of Infantile Convulsions of Reflex Origin" in connection with a case—a deeply interesting clinical study—in which a child of about seven years of age was restored from a state of apparent death by the hypodermic injection of a solution of the hydrochlorate of morphia. The child had epileptiform convulsions, and the chink of the glottis was spasmodically closed. The primary cause of the convulsions and spasms was the tickling of the intestinal nervous track by lumbrici. In the paper now referred to, when speaking of the hypodermic use of morphia in similar and kindred cases, I suggested that in very severe cases of infantile spasmodic croup—the "*faux croup*" of the French—the "spurious" croup of some English authors—similar treatment might be resorted to with safety and probable success. I remarked, at the same time, that "the croupal breathing of false croup is much more alarming to mothers and nurses than to doctors:" and I said that "as the cases are rare in whic endangered by that disease, the cases of it must be very exceptional in which the hypodermic injection of the hydrochlorate of morphia need be resorted to."

In the cases now to be related, though the laryngeal spasm was not treated by the hypodermic use of morphia, the principle which led to its adoption in the case of Henry J. B. was always kept in view—that principle being the prevention or relief of spasmodic muscular contraction by obtunding nervous irritability. For that reason—on account of the cases being fairly typical—and also on account of the minuteness with which the family history of the patients and other circumstances have been ascertained—they contribute some excellent materials for a clinical study of the nature, causes, complications, consequences, and treatment of infantile glotto-laryngeal spasm—an appropriate sequel to the previous paper on "Infantile Convulsions of Reflex Origin."

FIRST CASE.

Apparent Perfect Health on going to bed; Sudden Seizure during the night. One of six children, all of whom had similar attacks during Dentition.

James W. was born in Paris on the 20th March, 1874. Since his birth he has resided in the house in the Avenue des Ternes, to which I was summoned to his aid on the 31st May, 1875. On that day, soon after 2 a.m., his father came for me in great alarm. The atmosphere was clear, and a somewhat chilly breeze was lightly blowing from the north-east. The father told me that the child had been playful on the previous day, and just before being put to bed, about nine o'clock, gave evidence of health by taking a hearty repast of bread and milk. When lying in a crib in the bedroom of his father and mother, he awoke them about midnight by his noisy stridulous respiration. Before coming for me, the father had administered some ipecacuana wine, which induced vomiting and had temporarily relieved the breathing; but soon afterwards it became more noisy than it had ever been, and after an alternation of exacerbations and remissions the struggle for breath ceased to be paroxysmal, and was continuously noisy when the father left him to come for me. The father's statement on arriving at my house was that the struggles for breath were terrible to witness, and that it was impossible for a child to be in greater extremity. He concluded a graphic account of the sudden seizure and the alarming subsequent phenomena by repeating to me a statement which I had heard him make more than once previously, to the effect that he was "accustomed to croup," it being a disease from which every one of his six children had suffered in infancy, and that they "always had croupy breathing when they took cold."

On the following day, when all alarm had subsided and the child — though weary-like, hoarse, and slightly wheezy—was playing pleasantly on his mother's lap, I reverted to this statement. I was so much struck by the facts elicited by my first questions, that I pursued the inquiry with some minuteness, writing down the results of my examination and cross-examination, which I afterwards submitted to the father for revision.

I here introduce a digest of these corrected notes, before describing the case to which I was called at daybreak on the chilly morning of the 31st of May.

Medical History and Nervous Proclivities of the Family.

The father is a healthy man, aged fifty-four. He is not nervous in temperament. He has been twice married.

He describes his first wife as having been highly nervous and hysterical both before and after marriage.

The same description is applicable to the mother of James W., his present wife, of whom it may be mentioned as a noteworthy fact that she had mild chorea in early girlhood. She was twenty-eight when she married, and is now thirty-two years of age.

By the first marriage, there were four children, and by the second, there have been two, James W., aged fourteen months, being the youngest of the second family. All of these six children have had habitually more or less noisy crowing inspiration when suffering from common catarrhal affections; and they have all had alarming night-seizures of stridulous breathing from glotto-laryngeal spasm, demanding immediate medical aid. These night-attacks, to which the father gives the name of "croup," were evidently attacks of spasm of the muscles of the larynx constituting that form of infantile convulsion commonly called "spasmodic," "spurious," or "false" croup—an affection likewise described under various other names. I prefer the term "infantile glotto-laryngeal spasm" to all others, because, while it points out broadly that the disease in essence is a neurosis, it does no more: it is a name which even leaves unassailed the rather misleading statement of some writers that it is a neurosis engrafted on an inflammation.[1] Laryngeal catarrh is no doubt the most common of several common causes of the infantile glotto-laryngeal spasm which gives rise to the paroxysms of stridulous breathing called false croup.

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[1] I quote the following from p. 393 of the edition published in 1873 of the *Dictionnaire de Médecine et de Thérapeutique Médicale et Chirurgicale*, edited by Dr. Bouchut, Physician to the Hôpital des Enfants, and

In clinical discussions it is very desirable to employ terms which do not impinge upon the domains of controversy, nor even assert truths which are not universally recognised.

Some of the attacks of so-called "croup" which manifested themselves in the six W. children supervened when there existed an absolute freedom from catarrhal symptoms; others occurred subsequently to the development of more or less inflammation of the air-passages. Three characteristics belonged in common to all the attacks in all the six children; viz., 1st, their occurrence during the period of dentition;

Dr. Després, Surgeon to the Hôpital Cochin—a deservedly esteemed compendium of medical principles and practice as at present professed in France:

"LARYNGITE STRIDULEUSE, OU CROUP SPASMODIQUE, OU FAUX CROUP.—La laryngite striduleuse, maladie en apparence voisine du croup par l'âge des sujets où elle se montre, et par les accès de suffocation qui la caractérisent, n'est qu'une *névrose du larynx greffée sur une laryngite aiguë*"—a neurosis of the larynx engrafted on an acute laryngitis.

"Un accès de suffocation apparaissant d'emblée, sans phénomènes précurseurs chez un jeune enfant enrhumé et bien portant, accompagné de toux rauque, avec conservation de la voix, également rauque et non-croupale, disparaissant en quelques minutes ou en quelques heures, caractérise le *faux croup*, ou laryngite striduleuse."

It is necessary, perhaps, to remind some readers not familiar with French medical literature, that the expression "non-croupale" in the above extract signifies *non-diphtheritic*. In France "diphtheritic croup," "true croup," and "croup," have *unfortunately* become synonymous terms.

2nd, their sudden occurrence during the night; and, 3rd, their short duration.

The following is a sketch of the more serious attacks in each child.

First child.—J. W. W., the first son of the first marriage, was born at Rouen in France on 24th June, 1850. He had his first attack of so-called "croup" at Rouen in September 1852, when he was between fourteen and fifteen months old. He went to sleep at the usual hour in the evening—about nine o'clock—being then apparently in perfect health. An hour or two after midnight, his noisy crowing respiration awoke his father and mother, who were sleeping together with him in the same bedroom. Just as they simultaneously rushed to him, in great alarm, he had a succession of violent successive paroxysms of crowing, which sometimes passed into continuous dyspnœa, accompanied with purpling of the face. A medical practitioner was sent for, by whom medicines were promptly administered. In about three or four hours from the commencement of the attack, the crowing and suffocative paroxysms had entirely ceased, the child having fallen into a profound and prolonged sleep. From this sleep he awoke with a slight cough and slight oppression of breathing. During the day following the attack, these symptoms having continued, the medical attendant prescribed an emetic. After its action, which was prompt and powerful, the child breathed easily and seemed to be quite well for some hours. The oppression then returned to some extent: and for three days the child remained under medical supervision for catarrhal symptoms and nocturnal fits of stridulous dyspnœa. On or about the fifth day his health was perfectly re-established.

He remained quite well for some months—till December, 1852—when he had very severe diarrhœa and the hot swollen gums of teething. When suffering from these symptoms, he had a second attack of spasm of the larynx; it was less severe, but in all other respects it was very similar to that which has just been described. The child was then at Agular del Campo, near Santander, in the north of Spain. He was only two days under medical treatment for this second attack.

The second, like the first, attack occurred suddenly during the night. It was preceded neither by catarrh nor by any other premonitory derangement of health. Immediately after this second night-attack, however, the child became affected with slight cough and wheezing, which continued for several days.

A third and last attack of laryngeal spasms—the least severe of the three—occurred in Paris when he was cutting his second molar teeth. He was then within a few days of the completion of his second year. In the morning and afternoon, he was well and cheerful: in the evening there was no apparent diminished well-being, and he took a hearty—as was thought at the time a too hearty—supper just before going to bed at nine o'clock. About midnight he was suddenly seized with noisy crowing and strangulatory fits of laryngeal spasm, accompanied by purpling of the face. The cessation of the symptoms was nearly as abrupt as their commencement: it was announced by the welcome whistling sound which in such cases generally proclaims the sudden relaxation of the spasmodic closure of the glottis, and the consequent reopening of the great air-passage. This favorable crisis occurred spontaneously before the arrival of the medical practitioner who had been summoned.

At present (1875), J. W. W. is an active, healthy man. The attacks which I have now described from the father's statements were certainly attacks of infantile spasm of the glottis.

2. E. V. W., the first-born daughter of the first marriage, had her first attack when she was nine months old, at a village near Santander in Spain. It was less severe than the first and second attacks of J. W. W., and more severe than his third attack. Like the three attacks of J. W. W., it occurred suddenly during the night. A medical practitioner was sent for, who came immediately and continued to visit the child for several days. For two or three nights following that of the attack she repeatedly awoke with transient fits of noisy crowing inspiration, which occasioned no alarm. She twice had sudden night attacks in Paris before she was fifteen months old: they were similar to her first attack in respect of the laryngeal spasm. From the treatment—leeching, blistering and the use of emetics—adopted, in the first of the Paris attacks, it must have been exceptionally severe and was complicated probably with pneumonia, bronchitis, or acute laryngitis—with one or all of them. The second attack in Paris was of very moderate severity; but it was sufficiently alarming to cause a medical practitioner to be sent for on its occurrence during the night.

E. V. W. died of cholera at an early age.

3. V. W., the second daughter of the first marriage, had her first attack at Failaise in Normandy during damp muggy weather which had abruptly succeeded a long con-

tinuance of intense frost with a clear atmosphere. The medical practitioner who was summoned considered this sudden change of weather as the immediate cause of the attack. V. W. was apparently well when she went to bed. It had, however, been observed for some days previously that her gums were painful to the touch, hot, and turgid. The laryngeal spasms began suddenly about 2 A.M. or 3 A.M. They recurred incessantly for nearly three hours, during the latter half of which a medical practitioner was in attendance. He administered medicines, and had the child placed in a warm bath. He continued to visit the child daily for ten or twelve days for hoarseness and severe catarrhal symptoms which set in some hours after the first manifestation of the laryngeal spasms. During the first four or five nights which immediately followed the sudden attack of laryngeal spasms, the child was in the habit of awaking several times suddenly with noisy crowing, accompanied by a peculiar clenching of the fists with the thumbs stretched rigidly across the palms of the hands. It was when the father was calling my attention to an exactly similar spasmodic contraction of muscles in the case of James W. on 31st May, 1875, that he mentioned that he had several times witnessed an exactly similar phenomenon in V. W.

Twelve months after the first attack, V. W. had another seizure similar in its symptoms, though considerably milder in degree. At the time of its occurrence the weather was cold and dry; and the child was under treatment for diarrhœa. Three other moderate attacks of spasm of the larynx occurred within the three following months, during nearly the whole of which period there was a varying amount of cough, diarrhœa, dysentery, and intermittent fever. When four years old, she had measles complicated with inflammation of the lungs. At about twelve years of age, she had several attacks of general convulsions, rigidity of the limbs, and some other symptoms which were treated as "hysterical." Since the appearance of the catamenia towards the close of her fourteenth year, she has had no nervous seizures of any description. She is now a healthy though not a robust young woman.

4. R. W., the second son of the first marriage, was born in 1863. During dentition, he had two attacks of laryngeal spasm called "croup" by the father. One occurred during the night: the other during the day: the latter was apparently the immediate consequence of a fright. At the date of the first attack his age was twelve months, and at the date of the second, it was twenty-one months. After both attacks he had catarrhal symptoms of moderate severity for which he had medical treatment.

5. R.W., the first-born son of the second marriage, was born in Paris. My personal acquaintance with the family began on 7th January, 1874, upon my being asked to see this child. I found him suffering from lobular pneumonia. During the anxious progress of that malady I was one night summoned to his aid, at midnight,in consequence of his having had a sudden attack of so-called "croup" in his sleep. When I reached the patient there was no laryngeal spasm; but I was assured that there had been three strangulatory paroxysms in rapid succession prior to my arrival.

The countenance was purple and turgid—the dyspnœa very great, and the congested state of the lungs most urgent.

I was informed that just before I entered the room he had obtained sudden spontaneous relief from a strangulatory paroxysm.

This amelioration was only transient. Suffocative semi-asphyxial attacks—lasting from half a minute to two minutes—recurred at short intervals several times after my arrival. I remained for nearly three hours watching and treating the case. A few minutes after my arrival, I raised an immediate blister by applying the liquor epispasticus of the Br. Pharm.[1] to a surface on the front of the chest of about three square inches; and immediately afterwards, I administered with great difficulty an emetic potion consisting of one drachm and a half of ipecacuan wine, two drachms of brandy and six drachms of beef tea. Both the blister and the emetic were probably of the utmost importance; and to my having had the means of promptly employing them must be attributed the saving of this child in its extremity. Within less than three quarters of an hour, a striking change for the better had taken place both in respect of the breathing and the general appearance. This was wholly attributed to the blister by the family, for the rapid amendment was coincident with the rapid vesication. The emetic had also, however, unquestionably a large share in the favorable change; for its action on the stomach was accompanied by an unloading of the great and small air-passages by a discharge of a great quantity of light frothy serosity and some very tenacious mucus.

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[1] The *liquor epispasticus* of the British Pharmacopœia is an excellent application for raising an immediate blister; but when time is not all important, it is better to use a strong acetum cantharidis, which is less painful. The ether in the *liquor epispasticus* by drying the skin gives more pain. The strong acetic acid by softening the skin causes decidedly less suffering, a consideration of great importance in some cases. The *acetum cantharidis* of the British Pharmacopœia is too weak; for blistering an acetum four times that strength is required. A double fold of lint soaked in such a fluid is the best of all blisters.

At my early visit on three successive mornings, I was informed by the mother that there had been attacks of noisy crowing during the night. I did not witness any of these attacks. They were treated by the mother, in accordance with my instructions, by the application to the chest of large moderately stimulating poultices made of four parts of linseed meal, and one part of English mustard; also by the administration of an emetic of ipecacuan.

Ultimately complete recovery took place. The condition of the child, however, occasioned much anxiety for several weeks after the occurrence of the night incidents now described. Recovery from the broncho-pneumonic affection progressed slowly, and was chequered by several untoward circumstances—particularly by gastric disturbance accompanied by severe diarrhœa. The child afterwards suffered from constipation. For three successive nights during convalescence—having at that time obstinate constipation—he had crowing, threatenings of laryngeal spasm, and fist-clenchings accompanied by a fixed position of the thumbs on the palms of the hands. These symptoms always disappeared when the mother administered two or three doses —at intervals of about an hour—of a syrup which I had prescribed for use in such emergencies. The dose (a teaspoonful) contained three drops of the British Pharmacopœia tincture of hyoscyamus and one drop of the liquor of the hydrochlorate of morphia of the same codex.

On June 30th, 1875, at 6 A.M., I was again summoned to the aid of this child, who had had for some previous hours a succession of short fits of slight laryngeal spasm and fist-clenchings. I observed the same peculiar contraction of the thumbs which I had noticed in him on a previous occasion, when the nervous symptoms were complicated with inflammation of the lungs. The treatment adopted was twofold: it consisted in the immediate administration of a dose of the already described syrup of henbane and morphia, and its repetition twice at intervals of half an hour. Together with the first dose I administered a grain and a half of calomel, having been told that there had been no stool for more than two days. Very soon after taking the third dose of the syrup, he fell into a sound sleep, out of which he awoke, evidently distressed by the griping of the calomel. This distress was speedily relieved by a copious alvine evacuation, part of which consisted of hard round masses. On this occasion, the catarrhal affection of the air-passages was very slight: the intestinal irritation was no doubt the principal and perhaps the sole cause of the attack of 30th June.

So much for the medical history and neurotic tendencies of the family of James W., upon whose case—with the description of which I now proceed—they throw a most instructive light.

I now resume the history of the case to which I was called on the morning of the 31st May, 1875.

Two or three minutes after my arrival, the child had an attack of general convulsions, probably the secondary result of the asphyxia caused by the closure of the chink of the glottis induced by the primary spasm. The general convulsions, which were slight, soon ceased, but for ten or fifteen minutes longer there remained that peculiar contraction of the thumbs and toes described by Dr. Kellie, and now familiar to practitioners accustomed to the diseases of children. Simultaneously with the cessation of th general convulsions, the glotto-laryngeal spasm and semi-asphyxiated condition both ceased, this amelioration having been immediately preceded by the child's suddenly uttering a loud peculiar sound between a whoop and a whistle—produced by the inward rush of air through the sudden opening of the chink of the glottis. I soon afterwards left the child in a deep sleep.

When I called some hours later, I found the child free from spasm, cheerful, and sitting on his mother's knee. His voice, however, was hoarse, he wheezed a good deal, and had the tonsils red and swollen. I was assured that this catarrhal condition did not exist in any degree till after the alarming attack of stridulous breathing. This is an important point, for it shows that in this case, at least, the spasmodic affection was *not engrafted on an inflammatory laryngeal affection*, but really preceded the symptoms.

The treatment adopted was simple, and in principle similar to that usually followed in such cases, when the nervous tendencies form the predominating character of the case and the catarrhal symptoms constitute a comparatively unimportant feature. Though the tongue was clean, and there was no history of disorder of the digestive function, in order to get rid of any possible source of intestinal irritation, the bowels were cleared out by castor oil given by the mouth and a subsequent enema of tepid water. A band of flannel soaked in camphorated oil was applied round the throat which was ordered to be rubbed every eight hours with the same oil. The patient was placed with the least possible delay under the calming and obtunding influence of the mixture for which the following is the prescription :

℞ Liquoris hydrochloratis morphiæ, ♏xij,
Tincturæ hyoscyami, ♏xxiv,
Bromidi potassii, gr. xviij,
Syrupi aurantii, ʒvj,
Aquæ, ad ℥iij. M.

Six doses of one teaspoonful each were taken of this mixture, the interval between each dose being three hours. As during the eighteen hours there had been no renewal of the muscular contractions and no threatenings of spasm, the interval was increased to eight hours. Three doses of a teaspoonful each were given at intervals of eight hours, after which the interval was prolonged to twenty-four hours; and the dose was at the same time doubled, that is to say, two teaspoonfuls of the mixture were given at bed-time, and none of it at any other time. The object of administering a full dose of the soothing syrup at bedtime was to carry the patient in a state of obtunded nervous susceptibility through the chilly hours of early morning, that period of the twenty-four hours when there is the greatest liability in infants to spasm of the glottis. The double night dose of the sedative mixture was continued for about a week, the use of the camphorated oil being at the same time kept up as originally ordered. As a protective measure I directed that a flannel band should be worn round the throat for some time longer. With that exception, all other treatment was discontinued, the child being perfectly well.

The sudden attacks of laryngeal spasm in the W. family were evidently cases of the affection termed laryngismus stridulus by authors. Spasm was certainly the predominating and characteristic element in all the seizures: inflammation was sometimes absent, and when present was generally of secondary importance in respect of treatment.

A group of cases such as is presented by the W. family is particularly instructive, as it shows us that it is impossible in many cases to draw a sharp line of demarcation between laryngismus stridulus and stridulous laryngitis. The W. children, as their father remarked, "always had croupy breathing when they took cold"—in other words, slight inflammation of the air-passages induced stridulous breathing, the audible manifestation of spasm of the glottis; but "taking cold" was only one of the causes of irritation which induced spasm of the glottis in these children. In a pure and typical case of laryngismus stridulus there is no laryngitis; but it is also true that there exists a vast number of cases of slight laryngitis in which the inflammatory element need hardly be taken into account in the treatment, and in which the nervous element is everything. In point of fact, we meet with innumerable cases in practice which if we give them their correct name we must call cases of stridulous laryngitis, but which if we give them their correct treatment, we must either not treat at all as inflammatory affections, or only in a very limited degree.

When the inflammatory element predominates, our treatment for inflammation must also predominate. We have then to do with infantile laryngitis—the "inflammatory croup," and "stridulous laryngitis" of authors, a malady which requires to be combated by energetic antiphlogistic treatment local and general. Many years ago, when attending out-patients as a pupil under the supervision of the physicians of the Royal Dispensary of Edinburgh, I well remember treating several cases of this kind, under the instructions of my masters. The two principal measures adopted were leeching and purging.

When recovery took place in one or two very bad cases, I was led to believe that the recovery was due to the active treatment which had been adopted—a belief which was probably correct. I was also told by my instructors that unless active antiphlogistic measures were employed the case would advance to the generally fatal membranous stage, in which caco-plastic false membrane forms in the larynx and trachea, and sometimes descends into the bronchial tubes. I have now fortunately learned from Bretonneau and Trousseau that "membranous croup" is not an advanced stage of "inflammatory croup," but the characteristic manifestation of diphtheria, a general disease *sui generis* in which antiphlogistic measures are exceedingly prejudicial.

There is no one disease to which the name of "croup" can be rationally applied. It is a name under which are ranged diseases essentially different from each other, and it is in reality only intelligible when used as the name of a symptom — as the synonym of stridulous breathing. If we must retain the word "croup" in our catalogues of diseases we must use it with a descriptive prefix, and recognise three forms as Dr. R. H. Semple and others have pointed out—the *spasmodic*—the *inflammatory*—and the *diphtheritic*, the latter being the local manifestation of a specific general disease which attacks persons of all ages from infancy to old age. The purely spasmodic and the inflammatory often run into one another, and are peculiar to infancy. In both, there is spasm and stridulous breathing, these phenomena depending upon the patients' being very young children in whom spasm and convulsions are much more easily excited than in older subjects; and in whom also, from the narrowness of the larynx, stridulous breathing is much more easily induced. In cases of diphtheritic croup in young children, I have observed stridulous breathing recurring in paroxysms with intervals of apparent well-being, long before there was any physical obstruction to the entrance of air from the exudation of false membrane —when there was in fact nothing membranous visible but hazy specks of terrible import on the pharynx.

Correctly speaking, "croup" is not a disease, but a synonym for stridulous breathing—a symptom occasioned by many different causes, and which is a feature in laryngo-tracheal diphtheria (true croup of the French), as well as in laryngismus stridulus (false croup), and in stridulous laryngitis (inflammatory croup).

III.

PHARYNGO-LARYNGO-TRACHEAL

DIPHTHERIA:

ILLUSTRATED BY A TYPICAL CASE IN WHICH RECOVERY TOOK PLACE AFTER TRACHEOTOMY.

DIPHTHERIA A GENERAL DISEASE.

PHARYNGO-LARYNGO-TRACHEAL DIPHTHERIA.

On the morning of *Friday*, *October 24th*, 1873, soon after five o'clock, a young lady arrived in a carriage at my house, in a state of wild excitement and distress. The object of her visit was to fetch me immediately to aid her little brother, who, she informed me, had been, just before she left home, almost carried off in a suffocative paroxysm. She said he had gone to bed the previous evening between eight and nine o'clock, suffering only from a sore-throat and great debility, attributed to a diarrhœal attack of some days' duration. Until she was hurriedly sent to fetch me, he had not been supposed to require more than domestic medical treatment. On my way to the residence of the patient, I obtained from his sister most of the material facts embraced in the following history of the case.

On Monday, October 20th, 1873, E. G., an English child, aged six-and-a-half years, returned to school after his usual Sunday at home. He did not then seem quite well, yet there was nothing which appeared to call for his being specially attended to. On the 21st and 22nd, the master observed that the child frequently asked permission to leave the class for necessary purposes. On the afternoon of the 22nd, permission to retire was refused, under the impression that the request was made from a mere childish trick of idleness, and not under the constraining influence of a real necessity. The sequel showed that this was a mistake. When refused, the child burst into tears; and, unable to restrain the bowels from acting, his clothes were saturated with a copious alvine discharge. He was undressed; and, his drawers being wet and dirty, he was dressed without them and sent home to the house of his parents, that his condition might be inquired into and treated. On the 23rd, he complained of sore-throat, breathed badly, and was observed to have nearly lost his voice. He had several liquid motions during the day. To cure the purging, he was made to drink rice-water freely; and for the other symptoms, attributed to his having caught cold in consequence of his having been sent home without his drawers, his mother administered an emetic prescribed by a neighbouring pharmacien on her report of the symptoms. The emetic was taken just before the child went to bed. The emetic operation—violent and of short duration—afforded very considerable temporary relief to the dyspnœa, which had been becoming more and more urgent and more and more frequently paroxysmally exacerbated for the preceding twenty-four hours. It was about six in the morning of the 24th October—twelve hours after the action of the emetic—that I first saw the patient. I then, in reply to questions addressed to me, informed the family that my prognosis was not favourable.

The information I had received on my way to the house had excited my most unfavourable suspicions. A glance at the patient, and a few words spoken by him in reply to my salutation, confirmed my fears, and impressed me with the conviction that examination of the patient would show him to be stricken with asthenic diphtheria, already laryngo-tracheal, and probably advancing rapidly from bad to worse.

Before I entered, the child, as I was told, had considerably quieted from a sudden dyspnœal paroxysm. I found him supported in bed by pillows in a semi-recumbent position. His countenance was painfully anxious in expression, and of a dirty pallid complexion. His words were spoken distinctly, but very slowly and in a feeble husky whisper. The neck had a turgid appearance, the large veins showing conspicuously, and some of the glands on both sides near the maxillary angle were enlarged and somewhat tender to the touch. The pupils were responsive to the light; they were abnormally dilated. From the nostrils there was a slight serous oozing, which may be described as a dampness apparent at the nasal orifices and encroaching on the upper lip. The tongue, gums, tonsils, fauces, uvula, and the mucous membrane of the pharynx were coated in their entire visible extent with a tough tenacious substance of a dirty grey appearance. Having tied a handkerchief over my mouth to prevent the possibility of receiving any ejecta, I explored the patient's throat with the aid of a strong light. Observing a ragged edge of membrane on one of the tonsils, I took hold of it with forceps and easily stripped off a scrap of the unmistakably diphtheritic pellicle. The pulse was very feeble, and the extremities were cold. The intelligence was unaffected. He said that the pain, which for some days had been considerable in the throat, was gone, and that his only present distress was want of air. No words were required to tell me that intense air-hunger—to Anglic c expression employed by German physicians—was the immediate source of his distress. During my visit, which lasted nearly two hours, I had ample opportunity to make this and all other necessary observations.

The treatment I adopted was the immediate administration of a wineglassful of port wine and the application of turpentine stupes to the legs. I wrote a prescription for the glycerine of borax and the compound tincture of cinchona (both of the *British Pharmacopœia*) and waited their arrival. I smeared the whole of the diphtherically coated surfaces with the glycerate, and gave two drachms of the tincture in a second glass of port wine. Before leaving the house I unreservedly stated the extreme gravity of the case, and in particular mentioned that at any moment the operation of tracheotomy might be required to prevent closure of the air-passage by the rapidly forming membranous exudation. The child was in a decidedly less alarming state, in respect to immediate danger, than when I arrived.

I returned at ten o'clock. There was not then any apparent increased urgency in the symptoms. The mother fancied that the child's condition had ameliorated; but this opinion rested only on the fact that there had been no renewal of the dyspnœal paroxysm. A small quantity of urine passed half an hour before my return. When tested by heat and nitric acid, it was found to be very albuminous. Under all the circumstances, I deemed it right to repeat the unfavourable prognosis which I had already given. I intimated to the mother and other members of the family that I looked upon the child's life as in great jeopardy; that the disease was diphtheritic croup, by which the entrance of air into the lungs was being rendered more and more difficult by the air-passages becoming more and more blocked up by the formation of false membrane on its mucous surface, as well as by a submucous effusion of serosity; that at any moment the operation of tracheotomy might become imperative, and that its being rendered unnecessary by a change for the better could hardly be expected. I represented strongly the propriety of a consultation with another physician, and the despatch of a telegram to acquaint the father, temporarily absent in London, of the extreme gravity of the child's illness. The consultation was agreed to at once; but, from incredulity as to the gravity of the case and an unwillingness to alarm an affectionate parent, the telegraphic message was not sent. Had I been absolute dictator of the course to follow, I should at this time have immediately performed tracheotomy. There was no sufficient reason for delay. Nevertheless, as the opposition to the operation on the part of the mother was very strong, and as there still remained a short period during which emetics and other measures might be watchfully though not very hopefully tried, I reluctantly consented to act energetically in another direction, and delay tracheotomy till it was sanctioned in consultation. Forthwith I administered an emetic in port-wine negus. Some of this potion was swallowed, though with considerable difficulty; a small portion of it was returned through the nose. In about half an hour, active vomiting was induced for two or three minutes, during which some shreds of thick tough false membrane were ejected. This was followed by a decided though very temporary amelioration, due, no doubt, to partial clearing of the air-passage and general reaction directly caused by the operation of the vomitive. The pulse became stronger, the respiration easier, and the face lost a good deal of its congested semi-purple leaving the house about eleven o'clock, I ordered a continuance of the frequent local application of glycerate of borax, and the internal use of wine and cinchona.

At six in the evening, I found the child somewhat stronger, and breathing quite as easily as when I left him at eleven. There had been no suffocative paroxysm during my absence. It was agreed that my next visit should be at midnight, and that at nine next morning Dr. Benjamin Ball and I should meet in consultation. Till midnight, I directed a continuance of the treatment which I had laid down at my forenoon visit.

At midnight, I found that the temporary amelioration had ceased, and that the symptoms were even more alarming than I had yet seen them. The child had a semi-asphyxiated appearance, and breathed with great difficulty. The face was swollen and purple, and the neck was turgid. I sent a messenger to summon Dr. Ball, as it seemed very doubtful whether the operation could be delayed till nine next morning, the hour for which our consultation had been fixed. When Dr. Ball arrived, the patient was breathing much better. The only explanation of this change which suggested itself to us was that, in the terrible struggles for breath, portions of the laryngeal false membrane had become detached and displaced in such a way as to allow a freer admission of air into the lungs. After an anxious consultation, Dr. Ball and I came to the conclusion that, as the family were exceedingly opposed to tracheotomy, and as there was a remission in the symptoms, we might delay the operation yet a little longer.

Saturday, *October* 25*th*.—At nine o'clock, Dr. Ball and I met in consultation. We urged the operation as an immediate necessity, but without success. There being no increase in the urgency of the symptoms, we agreed to delay, and meet again at nine in the evening to decide the question. Several times during the day, I paid short passing visits, and on each occasion found matters getting worse and worse. At nine, when Dr. Ball and I met, we felt that there was no time to lose; the child was becoming asphyxiated. We insisted on immediate operation, or, if time permitted, a consultation with some eminent authority in such cases. We suggested that Dr. Jules Simon should be summoned at once, and before ten o'clock we were in consultation with him at the patient's bedside. He thought that the operation had been too long delayed, and strongly expressed himself to that effect to the mother, who looking at her child, then fearfully struggling for air, fully surrendered him to us. We told her that, without immediate tracheotomy, the child must inevitably die within less than an hour, perhaps much sooner; that it might be saved by the operation. We also said that, on the other hand, it might die ere the operation were completed. In so speaking, we did not exaggerate the gravity of the situation.

Dr. Jules Simon operated at 10 P.M. There was an immense flow of blood during the operation from the congested veins. The wound being freely held open for half a minute, large portions of false membranes were forcibly expelled by the expired air, and other large shreds were drawn out of the trachea by the forceps. Immediately before and also during the operation, a favourable issue seemed very improbable. No sooner, however, was the tube inserted, than the loss of blood ceased, and the symptoms of asphyxia disappeared. After the administration of some port-wine negus, the child fell asleep. I remained with him. He awoke in an hour, from portions of detached [illegible] membrane choking up the tube, and thereby inducing a momentary return of the asphyxial symptoms. Without taking the tube out of the trachea, I was able to clear it perfectly by dragging out large pieces of membrane. I remained with the child from the time of the operation till seven next morning. During the night, he slept a good deal, and took a fair amount of beef-tea, alternated with port-wine negus, to which latter a teaspoonful of the compound tincture of cinchona (*Brit. Ph.*) was twice or three times added.

Sunday, *October* 26*th*, 1 *p.m.*—Drs. Ball, Simon, and I met in consultation. There was some subcutaneous emphysema around the operation-wound. A bright rubeolar eruption was conspicuous on the trunk and on the legs. This eruption was faintly visible early this morning. The urine was intensely albuminous: it became a semi-solid mass when treated with heat and nitric acid. The pulse was 120; the temperature was 37.8 Cent. Shreds of false membrane were at this time being constantly got rid of through the tube. A mixture of perchlorate of potash and tincture of the chloride of iron was prescribed. Very little of this mixture was ever taken, the patient's mother objecting to ferruginous medication, which, she said, did not agree with her family.

Monday, *October* 27*th*.—At my first visit (7 A.M.), I found the condition not quite so favourable. There had been some oozing of blood from the operation-wound, the edges of which were coated with diphtheritic pellicle. The urine was intensely albuminous. The pulse was 120, very feeble The temperature was 37.8. At noon, his state was very similar. At 10 P.M., there was a still feebler pulse. The greatest difficulty had been experienced during the day in administering aliment. He was evidently in urgent want of his beef-tea and brandy, and yet he would not or could not swallow a drop of either of them. Under these circumstances, I resolved to remain with him some hours of the night. Forthwith an enema of beef-tea and brandy was administered to him. I left him for nearly two hours. On my return, he had another similar enema.

Tuesday, October 28th.—About three in the morning, I was slumbering on a sofa which commanded a full view of the patient, when I was aroused by the cries of his attendants and a strange noise proceeding from the patient. He was cold, comatose, and convulsed. In an instant, I withdrew the cannula, which was choked up with mucosity and membranous shreds. I kept the wound dilated, whereupon respiration was re-established, and a large quantity of frothy mucus expelled. The cannula was then replaced. The breathing was so feeble, the pulse so weak, and the surface so cold, that I feared the worst. A large cataplasm of mustard and linseed to the chest, turpentine stupes to the legs, and an enema of beef-tea and brandy were all quickly resorted to. In about an hour or an hour and a half from the time I was aroused, Dr. Jules Simon (whom I had at once sent for) arrived. The child had then very nearly recovered from the critical accident which has now been described. The day passed without the occurrence of any noteworthy incident, except that once the tube was taken out and cleared of the mucosity by which it had again become clogged. At 5 P.M., the pulse was 116, and the temperature was 38 cent. (100.4 Fahr.). The urine was still very albuminous, though decidedly less albuminous than it had been since the 26th.

Wednesday October 29th.—In the morning an amelioration in the state of the patient was observable. Th x, nostrils, and operation-wound were, for the first time since the operation, free from diphtheritic pellicle. The cervical emphysema and the rubeolar eruption had both disappeared. For an hour the cannula was withdrawn. For the last two days, the patient had taken an abundant and varied supply of stimulants and aliment, consisting of champagne, brandy, beef-tea, and pounded raw meat with its juice. He had, however, no desire for food. There was great wasting of the body. At noon, the pulse was 96, and the temperature 37·7 Cent. (99.8 Fahr.). There was observed at the same hour a notable diminution in the quantity of albumen in the urine. The urine examined was passed at 10 A.M. At my subsequent visits at 7 P.M. and 11 P.M., I found that there was a return of the fever. At seven o'clock, the pulse was 124, and the temperature was 38.8 Cent. (102.8 Fahr.). Some urine passed about 10 P.M. was much more albuminous than that passed at 10 A.M.

Thursday, October 30th.—The patient passed a tranquil night. This forenoon he remained without the cannula for more than an hour. During the day the breathing became oppressed; and, on examining the chest, the respiratory murmur in the right lung was found to have become feebler. At 9 P.M., I found that the condition had somewhat improved since the morning. The dyspnœa and feebleness of respiratory murmur in the right side had not increased. The urine passed during my visit was rather less albuminous than some which had been passed five hours previously and kept in a separate vessel. The pulse had fallen from 120 to 104; and the temperature was exactly the same as in the morning—viz., 38.8 Cent.

Friday, October 31st.—He passed a good night. At 1 P.M., the pulse was 104, and the temperature was 38 Cent. (100·4

Fahr.). During the greater part of the day he remained without the cannula. He was stronger. The alimentation had been diligently and successfully carried out. In the right lung, the respiratory murmur was very coarse.

Saturday, November 1st.—He passed a good night. He was the whole day, except an hour, without the cannula. The breath-sound was still rude in the right lung; but there was a return of air to the smaller tubes. There was a considerable sero-sanguinolent flow through the operation-wound, the edges of which had a healthy appearance.

Sunday, November 2nd.—The night was disturbed, but nevertheless his condition had improved. The pulse was 88, and firmer; the temperature was 37 Cent. (98.6 Fahr.). The right lung was much less engorged. The operation-wound was contracting. The child breathed through the larynx and the nose. The urine was still highly albuminous; but the quantity of albumen it contained was now insignificant, when compared to that which it contained on the 26th October.

November 3rd, 4th, and 5th.—These were three days of progressive amendment, during which the pulse varied between 84 and 88, and the temperature (often taken) was never found above 37.8 Cent. (100 Fahr.), and was generally about 37.2 Cent. (99 Fahr.) The urine, tested twice or thrice in the twenty-four hours, contained a constantly diminishing amount of albumen till the afternoon of the 5th, when not even a trace could be detected. During these three days, the child was without the cannula.

November 6th.—The improvement continued. The child slept well and much. He took abundance of suitable food with appetite. He could blow out a candle, and speak in a low voice. The operation-wound was very nearly, but not quite, closed.

November 7th.—For the first time, the child left his bed, and took his meals sitting at a table beside the fire.

December 1st.—The child being nearly well, daily attendance had lately been discontinued. He spoke in a natural manner. The tracheal wound was solidly closed, and the strength was steadily returning.

The medical and hygienic treatment after the operation consisted in good varied alimentation, pepsine being given with the food; a liberal employment of wine and other alcoholic stimulants; and the maintenance, day and night, of an equal temperature in the room, the atmosphere of which was moistened by steam from a tin basin of water below which a spirit-lamp was kept burning. I ought to add, that the room was spacious and the house situated in an airy locality adjoining the Champs Elysées.

December 24th.—The child had now regained sufficient health and strength to walk out, sleep, and eat very much as before his illness. He was, however, very thin. About November 20th, he was observed to be weak and languid, but in no way paralysed. On November 24th—about five weeks after the operation—paralytic symptoms were manifest. The child had a curiously restrained or rather contracted appearance, in consequence of the head falling forward and the shoulders being twisted. There was internal strabismus of the left eye. By an effort of the will he could raise his head, but was unable to correct the squint. The pupils were equal. The third and fourth pairs of nerves were not affected; the sixth pair only were paralysed. The power of accommodation was lost. He had no difficulty in swallowing, nor had he any paralytic symptoms whatever, except those now described. By the advice of Dr. Galezowski, a solution of eserine was dropped into the eye. Ferruginous tonic treatment, which had already been resumed, was continued. After fifteen days, the paralytic symptoms which I have described had entirely disappeared and no form of paralysis afterwards manifested itself.

The patient was in perfect health in November, 1874, twelve months after the operation of tracheotomy saved him from impending suffocation.

The case now described was a severe and a typical case of Diphtheria terminating in recovery, after death had been averted by tracheotomy which was imperatively demanded by the almost total exclusion of air from the lungs by the laryngo-tracheal manifestation of the disease. Tracheotomy saved the child but did not cure his diphtheria: it enabled him to breathe—to live—whilst Nature, judiciously and unceasingly assisted by Art, accomplished a cure. Such a case affords an excellent foundation for a clinical study of diphtheria.

The principal topics may be considered under the following heads:—

1. Manner of Invasion.
2. Diagnosis.
3. Symptoms and their Significance.
4. Prognosis.
5. Treatment.
6. Paralytic Affections.

THE INVASION OF DIPHTHERIA is generally occult and insidious. The disease takes full possession of its victim, in the majority of cases, without exciting the least alarm in him or in those by whom he is surrounded. So it happened in the case now before us. When E. G. was at home from school on Sunday the 19th October, his family thought that he was not quite well, though not so ill as to require any special attention. The patient was at that date already under the influence of the nascent disease. On Monday and Tuesday, 20th and 21st October, the schoolmaster imputed to childish trick and idleness conduct which was really the consequence of advancing illness. On the afternoon of Wednesday the 22nd the child, being broken down with diarrhœa, was sent home as an invalid. On Thursday the 23rd he complained for the first time of sore-throat, and was affected by dyspnœa and aphonia. These symptoms, if observed by an experienced medical practitioner, would no doubt have led him to suspect, and probably to discover, the existence of diphtheria. They did not, however, alarm the family, by whom they were not unnaturally attributed to catarrh caused by the child's having been sent home imperfectly clad when weakened by purging. Early in the morning of Friday the 24th, when I first saw the patient, the progress of the case had removed all difficulty from the diagnosis. The history of the case and the general character of all the symptoms pretty clearly showed the nature of the malady; and there was one sign which established the diagnosis beyond the possibility of error—the ragged scrap of membranous pellicle which I seized and easily stripped off with the forceps from the surface of one of the tonsils.

The invasion-symptoms of diphtheria are nearly always slight as well as insidious, a circumstance which imparts great difficulty to the diagnosis at an early stage of the disease. Families do not take alarm at the slight hoarseness of a child who is amused with his toys. Slight fever, a little languor, an occasional tickling cough, and a loss of voice are all symptoms which both individually and in a group are of frequent occurrence in children. They may be only transient catarrhal symptoms; but for the first three or even four days a diphtheria-stricken child will probably present no other indications of abnormal health. It is, therefore, a paramount duty of the practitioner when called to a child with what is apparently only a slight sore-throat, to make an examination of the throat with great care internally and externally, and to weigh what he sees together with all the information he can obtain regarding the history of the case and its general symptoms. This scrutiny will be imperative even with adults, if diphtheria be prevailing as an epidemic, or if the patient be living in contact with sporadic cases, or if he have been in any way exposed to the contagion of the disease. However skilful and minute the scrutiny of the medical observer, he will probably be unable for some days after the commencement of the disease to establish the diagnosis on a positive basis. In the invasion-stage it is generally impossible to form an absolute diagnosis. The early symptoms being generally slight and common to diphtheria and to trivial maladies, the disease is often allowed to pass into the exudation-stage before medical aid is sought. In point of fact, there is nothing uniform or characteristic in the symptoms of invasion. General discomfort, loss of appetite, debility, diarrhœa, rigors, pallor, husky voice, and hoarseness very often usher in diphtheria; but as they also often usher in various other maladies, they assist our diagnosis only when viewed in conjunction with other circumstances.

Invasion-symptoms may be absent, or the first symptoms which attract attention may be misleading.

invasion-symptoms, as well as the whole course of the cases, vary with the epidemic. This fact has been lost sight of by some systematic writers, who have artistically combined materials which for the sake of clinical truth ought to have been represented in separate pictures.

The poison of diphtheria may, it would appear, remain latent in the system for a long period—for how long it is impossible to say—and then, upon occasion given, suddenly manifest itself. In this respect diphtheria resembles ague, particularly the forms of ague to which the designation "pernicious" has been applied. I have to treat every year in Paris a considerable number of very severe imported cases of pernicious ague. I have notes of seventeen such cases treated in the years 1873, 1874, and 1875. They all occurred in patients who had been resident for a longer or shorter period in places in Italy, India, Ceylon, and some South American countries where remittent and intermittent fevers are endemic, and had been epidemic during their residence. Seven of these seventeen patients never had had neuralgia, ague, or any form of fever till their attacks in Paris. Three of them had been more than twelve months absent from the country in which they must have imbibed the long-latent poison. One of the three cases was under my care in October, 1875. The patient had been slightly ailing in London, just before coming to Paris on the way back to Ceylon, where he had previously resided in a district where bad remittents and intermittents are endemic. When in London he had consulted Dr. Dyce Duckworth for moderate chills and sweats. That physician successfully prescribed moderate doses of sulphate of quinine. When the patient left London he believed that he was quite well: but on arrival in Paris he was at once laid up with headache, intense pains in the back and limbs, violent shaking, and a feeling of great cold: after some hours a burning fever set in, which in turn was succeeded by a drenching perspiration. He had had the paroxysm now described, and another precisely similar, before I saw him for the first time. By these two attacks he was entirely prostrated, being unable to stand without support. The case was a serious one for some days, but the patient passed through his malady very satisfactorily, and after a detention of three weeks proceeded on his journey to the East. This gentleman's illness in Paris was considered by Dr. Dyce Duckworth—to whom the symptoms were fully reported—to be the manifestation of a latent fever-poisoning which had occurred more than a year previously in a malarious district of Ceylon.

I cannot adduce an exactly analogous case of diphtheria; but there is a class of facts which equally tends to prove that the poison of diphtheria may remain latent in the system till circumstances occur to call it forth. The seed, so to speak, is received into unsuitable soil, where it may either perish after a time, or remain in a state of latent vitality till the production of some change in the soil—or, in other words, in the condition of the patient—excites the reproductive power of the morbid germ. "You will see," says Trousseau, "in children who have been blistered on the arms for catarrhal affections, a very common practice, and which may even have been resorted to by medical practitioners—you will see the blistered surfaces become covered with false membrane, *if the children are living in the midst of diphtheritic contagion.*"[1]

TROUSSEAU:—Lectures on Clinical Medicine. See p. [illegible] of 2nd Vol. of New Sydenham Society's Translation: London, I have seen a catarrhal affection of the throat, the result of exposure to cold, become the starting-point of pharyngo-laryngo-tracheal diphtheria. Such cases have often been described as "catarrhal diphtheria," as if they constituted a variety of diphtheria; but it is not so, for the catarrh does not come from the diphtheria: on the contrary, the diphtheria comes, in a sense, from the catarrh, the latter being a lesion which acts as the immediate determining cause of the diphtheritic manifestation, though neither the cause nor a part of the diphtheria.

The fact that persons "living in the midst of diphtheritic contagion"—to use Trousseau's expression—may really be dangerously charged with the poison, even when apparently uncontaminated by it, is very suggestive of the importance of adopting prophylactic treatment in districts, houses, and families as has already been recommended in respect of persons living in cholera localities during cholera epidemics,[1] when persons in apparent health are often under the prevailing morbid influence, and when all diseases are often stamped with the choleraic type.

The dormancy or latency of the contagium of diphtheria under certain conditions is a subject of great practical importance, closely akin to the insiduous, masked, and almost hesitating character of what is commonly called the invasion-stage. Treatment directed then, and earlier, to the blood-lesion—the dominant lesion in diphtheria—may prove in a high degree protective or curative.

THE DIAGNOSIS OF DIPHTHERIA is frequently surrounded with great difficulties after the disease has passed out of the invasion-stage, and even when it has reached the period of cacoplastic exudation.

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[1] See Volume I, p. 275.

What are these difficulties, and how can we obviate them? What are the diagnostic signs of diphtheria? It is only the experienced practitioner who can fully understand and successfully grapple with the difficulties of these questions. The diagnostic rules laid down in systematic treatises require to be supplemented and corrected by that kind of knowledge which can only be obtained by clinical study—that is to say, by a minute and patient study of cases at the bedside.

As a general rule—with, however, one or two per cent. of exceptions—the diphtheritic exudation first manifests itself on the tonsils or pharynx, and next—not always in continuity—on the larynx. From one to seven days may elapse between the first appearance of the false membrane and its exudation on the mucous surface of the larynx. In some epidemics the larynx is a usual situation for false membrane to be first formed. In more than one sporadic case I have seen the first deposit of false membrane occur in the bronchial tubes, then in the trachea, and death take place without the larynx having been invaded. Many such cases are recorded by reliable observers who have compared the symptoms and phenomena during life with the autopsic appearances. In a case of this kind (which I saw once only during life) I did not discover the nature of the disease till I made an anatomical inspection after death.

In May, 1871, at 11 o'clock at night, amid the roar of artillery, the turmoil and the peril of the closing period of the second siege of Paris, a despairing woman arrived from Neuilly at my ambulance with a male child, aged about two years. She stated that it had been ailing for about six days, but that from the dangers of the bombardment she had been unable to leave her home to seek advice till forty-eight hours before she came to me. She had then gone to a practitioner, whose prescriptions she had since followed, and with whose sanction she consulted me. She attributed the child's illness and a severe catarrh from which she herself was suffering, to residence in a dark, damp cellar having been necessary for their safety for several days. Three leeches had been put on the upper part of the chest, and hot poultices of linseed-meal had been kept constantly applied to the entire chest except over the leech-bites. A mixture containing ipecacuan and kermes had been ordered at the same time, and had been given regularly at short intervals up to the hour at which I saw the child. The symptoms which then presented themselves were semi-asphyxia, coldness of the surface, and a general absence of breath-sound on auscultation, and dulness on percussion over the entire thoracic parietes. I recommended all medicines to be discontinued—a blister to be applied to the chest—and a teaspoonful of a mixture of brandy and beef-tea (one part to ten) to be given every hour till the child rallied, after which time—should it ever arrive, which I said was improbable—I ordered teaspoonfuls of milk to be alternated with the teaspoonfuls of the brandy and beef-tea mixture. The child lived till the evening of the next day, having for a short time rallied considerably under the change of treatment. Some hours after death I had an opportunity of making a hurried autopsy. The pharynx, larynx, and upper part of the trachea were free from false membrane. The lower part of the trachea, the bronchi and larger bronchial tubes were lined with a tough membrane, on carefully dragging which an arborescent continuity of the same was withdrawn from the smaller tubes. Peyer's glands and the solitary glands were prominent, and the mucous membrane around them was very vascular. Three lumbrici were found in the small intestine. I did not suspect the existence of diphtheria, till the post-mortem examination showed the disease under which the child had succumbed. The practitioner who treated the case before I saw it considered—not unnaturally under the circumstances—that he was treating pneumonia. This case is an example of the formation of diphtheritic false membrane commencing in the lungs.

A sister of this child, aged four or five years, died a fortnight afterwards of diphtheritic croup. I saw her twice and had no doubt as to the nature of the malady.

By most German writers the case of the male child would be called "croupous pneumonia." They have abandoned the original signification of the Scottish word "croup;" and now apply the term "croupous" to all affections characterised anatomically by the formation of superficial false membrane on subjacent mucous surfaces in a state of integrity. They speak of "croupous" nephritis, "croupous" gastritis, "croupous" bronchitis, and "croupous" pneumonia. In fact, in the medical literature of Germany, "croupous" and "pseudo-membranous" are synomymous terms; and some German authors, looking to the pseudo-membranous character of dysentery, call it "intestinal diphtheria." Leaving the meaning of terms for discussion in a separate article, it is sufficient here to say that the case of the male child was a typical example of diphtheria in a form well known to clinicians, though not a common form. As the starting-point of the diphtheritic exudation was in the lungs, the case might be styled "bronchial" diphtheria.

"Bronchitic" or "pneumonic" are objectionable prefixes, as they suggest the presence of a condition commonly called "inflammation," which is not the pathological condition present in diphtheria.

In October, 1875, I was in attendance on a lady about fifty years of age, who for about a week suffered very severely from a confluent eruption on the roof of the palate, tonsils, and back part of the pharynx, accompanied by swollen submaxillary and cervical glands. Together with these local affections, she had pains in the back and limbs, hoarseness, with occasional aphonia, anorexia, frequent vomiting, acrid eructations, bitter taste in the mouth, loathing of food, incessant cough (which sometimes occurred in suffocative paroxysms), sneezing, and coryza. This case, by mimicking certain phases of diphtheria, gave me some anxiety for forty-eight hours; but at the end of that period—and before the severity of suffering had moderated—an absolute diagnosis was established, and a favorable prognosis formed in consequence of a fresh herpetic eruption appearing on the lips and roof of the mouth. The duration of illness in this case of *confluent herpes of the throat* was nine days. The treatment consisted in the use of mouth-washes, and in administering bismuth, antacids, vegetable tonics, pepsine, and mild laxatives.

Confluent herpes of the throat has often been mistaken for diphtheritic sore throat; and the successful treatment of diphtheria so much boasted of by some writers may probably be explained by their having had to do with the essentially different disease—throat-herpes, called *herpes guttural* by Gubler, who was the first to give a good description of it. Cases occur in which the differential diagnosis of diphtheria of the throat and confluent herpes of the throat is not without a certain amount of difficulty. Whenever this difficulty occurs, the treatment ought to be such as may do good, and can at least do no harm, in diphtheria.

Trousseau states that it is sometimes impossible to determine whether a sore-throat be diphtheritic or herpetic. He says:—"The embarrassment is still greater, both in adults and in children, when, as often occurs, the characters which distinguish diphtheritic from herpetic membranous sore throat are not unmistakably clear. As Bretonneau has justly remarked, the question can sometimes only be solved by the dangerous tendency of the diphtheritic affection to extend to the tonsils, pharynx, and respiratory passages. During an epidemic, when the diagnosis is undecided, we ought in every case to be as prompt to act as if we had real diphtheria to combat; for it is better to treat energetically a malady which is not serious, than to run the risk of allowing one of an essentially malignant character to gain ground."[1]

In many cases, as in that which I have just described, the appearance of herpes on the lips removes all difficulty from the diagnosis. The manner of invasion in the two diseases is generally quite different. An attack of diphtheria of the throat is insidious; an attack of herpes of the throat is ushered in by an acrid burning in the throat, fever, and disorder of the stomach. The best help, however, in cases of difficult differential diagnosis between diphtheritic sore throat and herpetic sore-throat is based on the characteristic feature of diphtheria, viz. a specific exudation from mucous surfaces, wounds, and cutaneous abrasions. We often see the membrane form on the edges of the tracheotomist's incision in diphtheritic croup. The diagnosis between diphtheritic croup and the various kinds of non-diphtheritic membranous sore-throat can frequently be established without any harm to the patient by applying a *very small* blister to a convenient part of the body, such as the forearm. If the disease be diphtheria, the diphtheritic pellicle will appear on the vesicated surface.

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[1] TROUSSEAU:—Lecture on "Membranous Sore-Throat and in particular Herpes of the Pharynx." See page 439 of Vol. II of New Sydenham Society's Translation of the Clinique Médicale. London: 1869.

In some localities, and in some epidemics, diphtheria is much milder than in others. The general poisoning is more moderate, and the formation of false membrane does not proceed beyond the pharynx. The majority of such cases recover without treatment, and whether the treatment be good, bad, or indifferent. Some practitioners who have seen diphtheria only or chiefly in this mild form have complacently attributed the mildness of their cases to their own skill, and have expressed surprise that their successful methods of treatment were not universally adopted as soon as they were made known.

In some mild cases the nature of the case is not suspected, the patient being treated for a common sore-throat. Even, however, in the mildest cases of simple pharyngeal diphtheria, the appearance of the false membrane on one or both tonsils will be sufficiently characteristic to establish the nature of the case.

In scarlatina, the tonsils, pharynx, and nares often present appearances considerably resembling those which belong to diphtheria. This remark is specially applicable to the gangrenous ulceration of the tonsils met with in malignant forms of scarlatina. There is often in malignant scarlatina a membranous-looking coat on the tonsils, sometimes mistaken for the false membrane of diphtheria, to which it bears a general resemblance. If, however, the history of the patient's illness, the consistence of the membrane and its situation be studied with a view to the induction, a correct conclusion will generally be formed by a careful and experienced observer.

The pellicle of diphtheria is a leathery membrane, tough and difficult to tear. It has as its basis a cacoplastic fluid exuded from the surface on which it rests. This fluid, which may probably be correctly described as cacoplastic lymph, agglutinates a profusion of epithelial cells. The membrane thus formed consists of compact, tenacious layers, which, as Trousseau and others remark, give it a stratified appearance. The pellicle of scarlatinous sore-throat, on the other hand, is pultaceous and easily torn. In cases of scarlatinous gangrene of the tonsils, the substance which simulates the false membrane of diphtheria will, on examination, be found to be sphacelated mucous membrane with the addition of a pultaceous substance—a loose epithelial detritus. In a word, the important diagnostic distinction consists in the diphtheritic pellicle being a strong, tough membrane, and the scarlatinous simulation of it being a pultaceous, easily torn stratum of detritus, or a portion of gangrenous mucous membrane.

The formation of the diphtheritic pellicle generally begins on one or both tonsils after two or three days of some precursory redness and swelling, which are often so slight as to be unobserved. The pellicle, in most cases, first shows itself as a white patch of exudation on one tonsil: from this starting-point the formation of false membrane proceeds —generally but not always in continuity—rapidly to both tonsils, the veil of the palate, the uvula, and the pharynx, this extension being accomplished in young children in from one to three or four days, and in adults less rapidly. From the pharynx, except in mild cases, it descends into the larynx. It is not so in scarlatina, the larynx being comparatively seldom affected in that disease. To quote the familiar clinical saying of Trousseau:—"Scarlatina has no liking for the larynx."

Nevertheless, there exists in some cases a great difficulty in establishing an absolute diagnosis between diphtheria and scarlatina, in consequence of the unquestionable relationship which exists between the two diseases, notwithstanding their being pathologically distinct from each other. Diphtheria—as Graves and others have shown, and as Trousseau admitted in his later teaching—often follows so close in the wake of scarlatina as to seem to be one of its later stages. False membranes—diphtheritic membranes—form in the pharynx, and larynx, as an immediate sequel of scarlatina. In such cases, diphtheria has closely followed or been engrafted on the original attack of scarlatina. Trousseau's opinion on this point is probably correct.

"I cannot," says Trousseau, "prevent myself from believing, though I dare not affirm it as a fact, that the symptoms now under consideration depend upon a complication with a formidable form of diphtheria occurring at the close of the attack of scarlatina. The patients certainly sink with all the symptoms of diphtheritic poisoning, such as lowering of the general temperature, a small pulse, a fœtor of the breath exhaling from the mouth and nose, and a general paleness of the skin—a combination of symptoms not met with in any other serious disease. We can suppose, then, that in persons placed under certain conditions, as, for example, in a centre of epidemic diphtheritic influence, such as is, one may say, always dominant in hospitals for children, the scarlatinous sore-throat may become the starting-point of a diphtheritic attack, exactly in the same way as a small excoriation behind the ear, an ulceration of the vulva, or any other solution of continuity existing in persons in the midst of erysipelatous epidemic influences, may become the starting-point of erysipelatous manifestations. A circumstance which tends to support me in looking at the facts from this point of view is this—that I can only recollect one case of recovery from sore-throat supervening suddenly at the ninth or tenth day of an attack of scarlet fever. The patient who made this recovery was the daughter of my honourable friend Dr. Caffe. In true scarlatinous sore-throat, even of a serious character, beginning in the exanthematous fever and reaching its maximum intensity on or between the fifth and eighth days of the disease, recovery is the rule, and generally takes place without the assistance of art."[1]

In the passage now quoted Trousseau does not refer to malignant scarlatinous sore-throat, but to simple scarlatinous sore-throat, an affection in which a pultaceous deposit is generally formed.

Trousseau makes some excellent remarks on the differential diagnosis of the sore-throat of diphtheria, scarlatina, measles, and smallpox. He says:—"The diphtheritic affection has a tendency to spread to the nose and larynx, but the scarlatinous sore-throat generally remains confined to the pharynx; and notwithstanding Dr. Graves's condemnation of the proposition, I still maintain that *scarlatina has no liking for the larynx*. True scarlatinous sore-throat, then, is pharyngeal, differing in this respect from the sore-throat of measles, which is laryngeal, and from that of smallpox, which is both pharyngeal and laryngeal. The voice of scarlatinous one to three or four days, and in adults less rapidly From the pharynx, except in mild cases, it descends into the larynx. It is not so in scarlatina, the larynx being comparatively seldom affected in that disease. To quote the familiar clinical saying of Trousseau :—" Scarlatina has no liking for the larynx."

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Certain forms of sore-throat accompanying the exanthemata are more or less liable to be mistaken for the sore-throat of diphtheria. Practitioners who have clinically studied these affections are seldom mistaken in their differential diagnosis. The medical history of each case will generally be sufficient in itself to establish the nature of the case. In respect of scarlatina, however, we must remember that at its subsidence a sore-throat may set in which is not scarlatinous, but is a real membranous—that is a diphtheritic sore-throat—a manifestation of the general disease diphtheria, to which convalescents from scarlatina are peculiarly disposed in certain localities and during epidemics of diphtheria.

Cutaneous Eruptions—some of which have a great resemblance to the eruption of scarlatina—frequently make their appearance in the course of diphtheria. In the report of the case of E. G. I mentioned that on the 26th October—probably the seventh or eighth day of the disease—"a bright rubeolar eruption was conspicuous on the trunk and on the legs." Sometimes, if the eruption itself were the only guide to the diagnosis, it might easily be declared to be one of the forms of the eruption of scarlatina. The eruptions of diphtheria which simulate those of scarlatina are sometimes vesicular, sometimes like urticaria, and sometimes they occur in large bright-red patches. Unlike the eruptions of scarlatina, they are not followed by desquamation. That they are not scarlatinous is sometimes proved by their being succeeded by the true scarlatinous eruption; for convalescents from diphtheria are as much disposed to take scarlatina as are convalescents from scarlatina to take diphtheria.

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[1] TROUSSEAU:—See p. 180 of 2nd vol. [Lecture on Scarlatina] of the Translation of the Clinique Médicale for the New Sydenham Society. London: 1869.

The eruptions of diphtheria seldom continue more than three days and sometimes are visible for only a few hours. They differ much in appearance; yet we must nevertheless look upon them as the results of the special contagium of diphtheria just as the different though less varied eruptions of scarlatina proceed from the special poison which engenders that malady, or as the manifold eruptions arising from toxæmia are dependent on morbid and non-morbid poisons. The eruptions of diphtheria, particularly in relation to their causes, have been carefully studied by Professor G. Sée, of Paris, who believes that they are toxæmic, and also that they are pathologically distinct from the eruptions of scarlatina.

THE SYMPTOMS OF DIPHTHERIA—general and local—and *their respective significance* next claim attention.

The *General Symptoms* of pharyngo-laryngo-tracheal diphtheria are of course simply those of the general specific disease diphtheria. They are the same wherever the false membranes are exuded—whether on the tonsils, pharynx, larynx, trachea, bronchial tubes, nares, eyelids, vulva, vagina, uterus, anus, or on a wound, ulcer, or cutaneous abrasion.

Some of the general symptoms are constant and others are occasional.

The Constant General Symptoms of diphtheria are :—

Prostration of strength ; and

Formation of false membrane.

The Occasional General Symptoms of diphtheria of most importance are :—

Albuminuria ;

Abnormal Temperature ;

Cutaneous Eruptions ;

Enlarged Glands ;

Paralytic Affections.

Prostration of strength—great and prolonged prostration of nervous power—characterised the case of E. G., from first to last, as is usual in diphtheria. Extreme depression of the vital power is a constant condition in this disease. Sometimes this vital collapse is so great from the very beginning of the attack as to be in itself the cause of immediate danger and even of rapid death. In some cases, it carries off the patient in a few hours, and before any false membrane has had time to form, and before any characteristic symptoms have shown themselves. Patients sometimes die from diphtheria after an illness of only a few hours ; they succumb to the primary impression on the nervous system caused by an overwhelming dose of the diphtheria-poison. In rapidly fatal diphtheritic poisoning, there are degrees of rapidity—that is to say, there is a gradation of cases from those in which death takes place in six hours, with scarcely any signs of diphtheria except prostration and death, to others in which, from the shock of the poisoning being less violent in its operation on the nervous system, time is afforded for a greater or less manifestation of false membrane on the tonsils and for other symptoms to show themselves, such as turgescence of the cervical glands and albuminuria. In some epidemics these fearfully rapid cases do not occur: in other epidemics they occur frequently—the patients dying from general poisoning before any manifestation of French "croup," which, to prevent ambiguity, I have spoken of under the name of "pharyngo-laryngo-tracheal diphtheria." In the admirable clinical history of diphtheria in Florence, from 1862 to 1872, published by Drs. Carlo Morelli and Leopoldo Nesti, mention is made of cases of diphtheria proving fatal within a few hours. In these cases great depression of the nervous powers was accompanied by rapid formation of false membrane on the visible mucous surface of the throat. We are told by Morelli and Nesti that the rapidity and fatality of the disease was greatest in young children, and that the less the age the greater was the rapidity of the fatal issue. A similar remark has been made by the historians of epidemics of other dates and other countries. In the great Florence epidemic the beginning and the end of the attack were sometimes comprised within a space of little more than six hours.[1]

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[1] MORELLI (Carlo) e NESTI (Leopoldo):—Istoria Clinica della Difterite osservata nella Città di Firenze e suoi Dintorni dal 1862 al 1872.

From page 5 I extract the following sentences:—"Avveniva in alcuni casi di videre crescere ed estendersi nel modo il più rapido, questa materia [the false membrane] per tutto l'istmo delle fauci, occupare l'arco intiero del palato molle, salire nelle fosse nasali posteriori et discendendo per le vie dell' aria portare presto un cambiamento nel tuono della voce, molta difficoltà nell espirazione e assai maggiore di quella dell' ispirazione; e con pochissimi conati di tosse, con raramente di vomito diminuite grandemente le forze e le azioni del sisema nerveo-musculare, farsi depresso il volto, e venire meno la vita in pochissime ore con *le*

Analogous cases occur in other poison-diseases—cases in which the poisoning is so rapid that death takes place before a sufficient time has elapsed for a manifestation of the ordinary phenomena. This has been particularly observed in scarlatina. In some epidemics it is not very unusual for the patient to die before there has been time for the characteristic eruption and sore-throat to manifest themselves. During an epidemic of scarlatina which desolated many homes in London and its environs in 1848 I saw four cases at Putney in which death occurred prior to the appearance of the eruption. In two of these cases the sore-throat was just beginning when death occurred. In one of the cases the entire duration of the disease was less than three days ; in it there was neither sore-throat nor eruption : after one day of restlessness came two days and two nights of wild delirium, accompanied by scanty urine and intense albuminuria, ushering in œdema of the glottis, œdema of the lungs, general anasarca, and death. The latter case occurred in a family in which I had recently attended, or was then attending, five other severe cases of scarlatina in which recovery took place, all the usual symptoms having been well-marked.

In all forms of diphtheria, prostration is a leading symptom of the disease. In some cases at the very onset of the attack it is so overwhelming as to destroy the patient before the ordinary phenomena of diphtheria have had time to show themselves.

The exudation of cacoplastic lymph and consequent formation

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apparenze della carboniœmia. Nei teneri fanciulli la rapidità e la letalità del morbo crescevano in proporzione della tenerezza degli anni, e *non rare volte il male ha incominciato e finito nel lasso di poco più di sei ore.*"

of false membrane (of which membrane the exudation is the base) constitute the characteristic manifestation of diphtheria. It is a symptom of the general disease which is almost never wanting unless the advent of death be too rapid to allow time for its manifestation.

Some authors have unnecessarily complicated their descriptions of diphtheria by enumerating various forms of the disease according to the situation of the false membrane. The rigid classification of cases in anatomical groups is, however, clearly impossible, as the false membrane is generally present in several situations in the same case. For example, in the case of E. G. it was formed on the nostrils, tongue, gums, and operation-wound, as well as on the mucous surface of the pharynx, larynx, and trachea. While, therefore, for convenience of clinical description we use such terms as pharyngo-laryngo-tracheal, bronchial, nasal, vulvar, vaginal, uterine, or cutaneous diphtheria, we only point out the situation, or it may be one of the situations of the pellicle, just as when we speak of erysipelas of the head, leg, or arm we only mean that the head, leg, or arm is the locality, or one of the localities in which the general disease has shown itself. In whatever part of the body diphtheria or erysipelas shows itself it is a manifestation of one general disease.

The cacoplastic exudation I have said is *almost* never wanting in diphtheria when the patient lives long enough to allow time for its appearance. The word *almost* was required to qualify the general statement, for in diphtheria as in all other poison diseases exceptional abortive cases occur—cases in which there is arrest of development of the morbid germ. One kind of arrested development consists in the non-appearance of the pellicle, as my friend Michel

Peter has well stated in his inauguration thesis, where he uses as nearly justifiable terms "diphthérite *sine diphtheria*,"[1] "rougeole *sine morbillis*," and "scarlatine *sine scarlatina*," all of which arrestations I have seen many times during epidemics of the respective diseases. Most practitioners in the course of years make acquaintance with them.

CERTAIN IMPORTANT SYMPTOMS which though often, are not always present even in well-marked cases of diphtheria, I shall now refer to.

Albuminuria;
Abnormal Temperature;
Cutaneous Eruptions;
Enlarged Glands;
Paralytic Affections.

1. *Albuminuria*, a conspicuous symptom in the case of E. G., exists in a very large proportion of the cases of sporadic and epidemic diphtheria. Dr. W. F. Wade, of Birmingham, made this fact generally known to the medical profession by a paper which he published in the *Midland Quarterly Journal of the Medical Sciences* for April, 1858. This paper was soon afterwards quoted in the *Archives Générales de Médecine*, and was thus brought under the notice of Trousseau, who in his published lectures gives Dr. W. F. Wade the credit, justly belonging to him, of having first brought the subject of albuminous urine in

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[1] PETER (Michel):—"Je n'irai point jusqu'à dire qu'il y a eu dans ces cas diphthérite *sine diphtheria*, mais je crois qu'il y a eu un arrêt de développement. La maladie *diphthérique* par son origine est restée inflammatoire dans son expression en s'arêtant à la première phase de son évolution."—Quelques Recherches sur la Diphthérite et sur le Croup faites à l'occasion d'une Epidémie observée à l'Hôpital des Enfans en 1858. Thèse de Paris, No. 270. Paris, 1859.

diphtheria under the notice of the profession at large. Dr. W. F. Wade first announced his discovery on the 15th December, 1857. On that day, at a meeting of the Queen's College Medico-Chirurgical Society of Birmingham, he showed kidneys removed from the body of a subject who had died of diphtheria. He, upon that occasion, called the attention of the Society to the morbid changes presented by these organs, and asked the members present to examine the urine of their diphtheritic patients, feeling assured, as he then stated, that the urine was albuminous in the subject from whom the exhibited kidneys had been taken. A physician present examined the urine of a diphtheritic patient on the following day, and soon afterwards he and others announced that they had, as a rule, discovered albumen in the urine of diphtheritic patients.

Trousseau, while he awards the palm of priority to Dr. W. F. Wade, intimates that before he became acquainted with that physician's researches, he knew that the urine is often albuminous in diphtheria, having learned that fact from an unpublished memoir of Abeille. Trousseau, referring to Dr. W. F. Wade's discovery, says:—

"This discovery, from having been originally published in the *Midland Quarterly Journal of the Medical Sciences*—a periodical little circulated on this side the Straits of Dover—remained for a long time unknown in France. Like everybody else, I was ignorant of the discovery, when there fell into my hands an unpublished paper by Dr. Abeille, who was the first, to my knowledge, to mention diphtheria among the diseases in which we meet with albuminuria. Since that time I have lost no opportunity of looking for albumen, which I have several times found in the urine of diphtheritic patients in the clinical wards, and [illegible]il to notice in my clinical lectures during 1857. In a lecture delivered on the 23rd June, 1858, Dr. Germain Sée, ignorant of the researches of the English physician and of Dr. Abeille, called in a more particular manner general attention to the frequency of albuminuria occurring in malignant sore-throat and in croup both before and after tracheotomy. He stated that in his wards in the Children's Hospital the urine of all the diphtheritic patients was examined for albumen every day, and that at least in one third of the cases it was found in notable quantity. It is, therefore, as Dr. W. F. Wade originally stated, and as I have verified before you, very common to find albumen in the urine of diphtheritic patients."[1]

In 1858, the same year in which Dr. W. F. Wade's paper appeared, Dr. Germain Sée, brought the subject of albuminous urine in diphtheria under the notice of the Société Médicale des Hôpitaux of Paris. Since that date, it has been treated of by numerous British and foreign authors, some of whom have written from clinical data occurring under their own observation. Dr. W. F. Wade was first in publication; but it is equally certain that Dr. Abeille, Dr. Germain Sée and Dr. W. F. Wade made the discovery independently of each other and at about the same date.

Individual peculiarity and the different constitution of epidemics greatly influence the presence or absence of this symptom, and also the degree of its intensity when present. Neither by degrees of albuminuria, nor by its presence or absence, can we gauge the gravity of cases. As in scarlatina, so likewise in diphtheria, I have noticed its absence in cases of maximum severity, and its presence in very mild cases. It varies much in intensity from day to day, and is not unfrequently intermittent. The difference in the prognostic importance attached to albuminuria by clinical authors of the highest class is probably explained by some of them drawing general conclusions from the limited number of cases they have had an opportunity of personally subjecting to rigid scrutiny. Diphtheria, except when epidemic, is not a common disease; and as it generally sets in very insidiously—very often unobserved—and runs a rapid course, comparatively few cases are minutely observed by skilled observers from their beginning to their end.

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[1] TROUSSEAU:—'Lectures on Clinical Medicine,' vol. ii, p. 537, of New Sydenham Society's Translation. London, 1869.

Trousseau has perhaps expressed nearly all that can be stated on the practical significance of albuminuria in diphtheria. In summing up a short discussion on the subject, he says:—"The presence of albumen in the urine of diphtheritic patients . . . is a frequent occurrence, but one which in the actual state of our knowledge *has only a limited signification in relation to prognosis and treatment.* It is, however, impossible to deny that it is the expression of a great disturbance of the organism produced by the morbific principle which engenders diphtheria."[1]

Sir William Jenner expresses an opinion very different from that of Trousseau, basing it no doubt only on his own cases. He says:—"*Even a trace of albumen in the urine is an unfavorable symptom; when very abundant, a fatal termination of the case is most probable.* The albuminous urine probably indicates rather an abnormal state of the blood than disease of the kidney. At least, after death I have never seen more than congestion of the kidneys. When the albumen is abundant and the urine scanty, some of the symptoms of uræmia may be conjoined with those of exhaustion, *e. g.* extreme drowsiness, a little wandering of the mind and a rapid and feeble pulse." As a general statement in respect of diphtheria it is impossible to accept Sir William Jenner's opinion that "even a trace of albumen in the urine is an unfavorable symptom," and that "when albumen is very abundant a fatal termination of the case is most probable." Sir William Jenner's clinical inductions command respect and generally assent, because his various researches have proved him to be expert and careful as an observer and logical as a reasoner. Yet I may be allowed to say that his conclusions now quoted in respect to the significance of albuminuria in diphtheria are not supported by all the trustworthy clinical histories of diphtheria in different times and places, nor by my own limited experience of the disease.

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[1] TROUSSEAU:—Vol. ii, p. 538, N. Syd. Society's Translation.

The history of diphtheria at Florence and in its vicinity from 1862 to 1872, so admirably told by Morelli and Nesti, contains the following passage in relation to this point:—

"Diphtheria is one of the many diseases in which there is albuminuria. During the course of that malady, its presence is not unusual." . . . . "In the morbid constitution which has been here dominant for the last two years, and which still prevails, I have had opportunities of noting the coexistence of albuminuria and diphtheria, having found albumen in the urine frequently and in large quantity in the present epidemic. Transitory and intermittent albuminuria constitute at present a morbid phenomenon of very frequent occurrence in cases of diphtheria. It has not, however, appeared to me to bear that constant relation to the course and the issue of the disease attributed to it by Bouchut particularly when affecting the respiratory passages, to the effect that its appearance prognosticates an unfavorable, and its disappearance a favourable termination. Among the many cases of simple diphtheria which I have seen, albuminuria does not hold that important relation, and whilst it is absent in cases of very great severity it is detected in the course of very mild cases."[1]

Similar statements regarding the significance of albuminuria in the same Florentine epidemic are given by others. A paper entitled "Appunti sulla Difterite" [Remarks on Diphtheria] was laid before the Società Medico-Fisica of Florence by Dr. Cesare Bottari in 1872. In the report made on that paper to the Society by a special committee, one short paragraph only is devoted to albuminuria. The brevity of that paragraph and the views therein set forth clearly show that the physicians of Florence, whose ability and reliability as observers are undoubted, attach very little practical importance to albuminuria in diphtheria. The reporters say:—"With respect to albuminuria, it is not a constant, but certainly a very frequent phenomenon in diphtheria, in which disease it makes its appearance very early. It was often observed in our epidemic, but was unattended by any special character meriting your particular notice."[2]

In scarlatina, we usually find albuminuria associated with anasarca, œdema, and effusion into the serous cavities.

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[1] "Fra i non pochi casi che vidi di semplice male difterico l'albuminuria non tenne questa importante relazione, e mentre mancò in casi gravissimi, la potei constatare nel corso di casi di morbo assai mite."—Op. cit., p. 16.

[2] I quote from *Lo Sperimentale* for 1873.

This association very seldom occurs in diphtheria. Bouchut, however, states that he has met with cases of this exceptional description. He mentions two fatal cases of diphtheria, having a duration respectively of eight and eleven days, in which there occurred anasarca, œdema of the limbs, and effusion into the serous cavities. At the autopsy, in both cases, the kidneys were found to be hypertrophied, their surface in some parts of a pale and yellowish colour: the uriniferous tubes were in a greatly altered condition, denuded of epithelium and infiltrated with fat. The rarity with which any form of dropsy is associated with the albuminuria of diphtheria is a noteworthy fact. Bouchut's cases are exceptional.

From the early period of the disease at which we frequently find albumen in the urine of diphtheritic patients, we must conclude that it is often caused by the direct influence of the specific poison on this system. Sometimes its causation is, no doubt, indirect, depending on renal congestion, the consequence of the diphtheritic blood-lesion. Its frequently transitory and intermittent appearance also tends to show that it is due in many cases to the direct action of the diphtheritic poison on the nervous system.

In Morelli and Nesti's history of the Florence epidemic, seventeen autopsies are fully described.[1] From these instructive accounts, I extract entire the statements made in each case in respect of the kidneys, the bladder and its contents. In doing so I may remind the reader that albuminous urine is found in the bladder after death although there has been no albuminuria during life.

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[1] The first fourteen cases terminated fatally at a comparatively early stage of the disease: the three other cases—which I have numbered 15, 16, and 17—narrated by Nesti in his chapter on Diphtheritic Paralysis (pp. 138—160) were of longer duration.

1. *Zaira M.*, aged six years.—"The kidneys, which were normal in volume and consistence, were throughout exceedingly hyperæmic. In the bladder there were about fifty grammes of urine, which yielded a copious precipitate of albumen when treated with nitric acid. Examined microscopically, the urine was found to contain numerous shining granules of unknown nature, together with some epithelial cells."

2. *Ernesto M.*, aged seventeen months, the brother of Zaira M.—"The spleen, and still more the kidneys, were exceedingly hyperæmic. In the bladder there was a small quantity of limpid orange-coloured urine which gave the characteristic reaction of albumen when treated with nitric acid."

3. *Giovanni R.*, aged six years.—"Nothing noteworthy was observed in the kidneys."

4. *Eugenia di S. R.*, aged thirteen years, the cousin of Giovanni R.—"The kidneys, which were normal in volume and consistence, were exceedingly hyperæmic: they presented a deep-red colour, both in their cortical and medullary substance." On or about the sixth day of the disease albumen appeared in the urine, and it went on increasing in quantity, judging by the appearance of the coagulum.

5. *Genny N.*, aged four and a half years.—"The spleen and kidneys were hyperæmic. In the bladder there was a small quantity of albuminous urine."

6. *Elena M.*, aged five years.—In the account of the autopsy in this case no mention is made of the kidneys.

7. *Elizabetta S.*, aged five years.—"The kidneys were of a deep wine colour, both externally and on the surface of a

section. The bladder contained a small quantity of limpid, orange-coloured, albuminous urine."

8. *Palmira di R.*, aged three years.—"The spleen and kidneys, particularly the latter, were exceedingly hyperæmic. The urine was of an intensely yellow colour and contained albumen."

9. *Agabo S.*, aged five years.—"The kidneys, which were normal in volume and consistence, presented a dark colour both externally and on the surface of a section, and were gorged with blood. The bladder contained a small quantity of albuminous urine. Numerous bacteria were found in the blood of the spleen and kidneys."

10. *Ruggero C.*, aged three years.—"The bladder was empty. Examined under the microscope, the spleen and kidneys were found to present a very significant appearance of granulo-adipose degeneration."

11. *Attilio V.*, aged six years.—"The kidneys were rather soft, easily torn, and slightly engorged with blood: this cortical substance was rather pallid, the pale colour merging into a yellowish hue, indicating fatty degeneration of the renal epithelium, as was verified by microscopic examination."

12. *Bianca B.*, aged fourteen months.—"The kidneys, which were normal in volume and consistence, were exceedingly hyperæmic. The bladder contained some urine, which was albuminous."

13. *Giovannina M.*, aged four years.—"The kidneys were in a state of sanguineous congestion, particularly in their medullary and cortical tissues." The urine was found to be not albuminous till the day before death, when it presented a slight cloudiness on being heated.

14. *Guido di L. B.* (age not stated).—"The kidneys

were rather pale, and of less than natural consistence: in the sulcus, the cortical substance was of a red colour, merging into yellow. The renal epithelium was partly destroyed and converted into a molecular detritus mixed with drops of fat and shining granules of an unknown nature. There was no urine in the bladder.

15. *Guilia N.*, aged four years.—"The kidneys, which were of normal volume and consistence, were very hyperæmic. The bladder was empty."

16. *Paolina C.*, aged three years.—"The spleen and kidneys were gorged with black fluid blood. The bladder was empty."

17. *Bigazzi O.*, aged twenty.—"The kidneys were rather voluminous, and were much injected with dissolved blood. The calices and pelvis of the right kidney contained small gravel of the phosphate of lime, and their mucous lining was smeared, as it were, with a muco-purulent fluid. The bladder contained sixty grammes of turbid urine, which gave a copious precipitate of albumen when treated with nitric acid: a similar result was obtained by exposing the urine to the heat of a lamp. When the urine was allowed to remain at rest for some hours, there was visible at the bottom of the vessel a whitish deposit, in which were seen, with the aid of the microscope, numerous crystals of the triple phosphate imbedded in a large quantity of amorphous matter composed of granules of protein and fat, some renal and vesical epithelium, and some red blood-globules. A portion of this urine left in a small glass became dark-coloured; and presented on its surface a bluish pellicle which was put aside for microscopic examination. It was entirely amorphous, and was composed of a large number of very minute granules: the circumstance, however, which specially arrested attention,

was its having a colour identical with Prussian blue, and its containing some similarly coloured crystals of triple phosphate. The same urine, preserved twenty-four hours longer, became still darker in colour, and had on its surface a thicker pellicle. This pellicle, when subjected to renewed examination, showed that the granular material of which it was composed had preserved the same blue colour: the crystals of triple phosphate disseminated in it had acquired a beautiful violet colour. The peculiar character of the urine of this patient induced me to refer its chemical analysis to Professor Capezzoli. When it was treated by ether, there was precipitated a copious violet pigment which Professor Capezzoli attributed to the presence of uroxanthine." The patient whose urine has now been described was admitted to the hospital of S. Maria Nuova of Florence with diphtheritic anæsthesia and paralysis on the 16th May, 1872, and died there on the 6th June. The attack of diphtheria began on the 17th April. The symptoms were at first mild."

Albuminuria exists at a very early stage in many cases of diphtheria—often within the first twenty-four hours. In such cases it cannot be a secondary toxic phenomenon. The renal congestion found after death, and the albuminuria during life, are both direct consequences of a great blood-lesion—imperfect hematosis—resulting from a profound toxic impression on the hæmapoïetic organs produced through the nervous system by the diphtheritic contagium. Reliable authorities have observed and published cases in which the albuminuria was found to exist at so very early a stage of the disease as to preclude the supposition that it depended upon secondary toxæmia.

From Dr. J. Burdon Sanderson's 'Contributions to the

Pathology of Diphtheritic Sore Throat and other Kindred Affections,' I quote a case in point.

"W. R., *a female*, æt. 39.—Albuminuria appeared the first day; abundant at first, subsequently accompanied with hæmaturia; both diminished rapidly after the sixth day; waxy casts at first, subsequently casts containing epithelium and blood-corpuscles.—*General Character of Symptoms:* slight throughout; no marked depression; concretion granular, limited to tonsils; principal complaint of lumbar pain.—*Result*, recovery. No sequelæ; but persistence in urine of small quantity of albumen."[1]

Dr. J. Burdon Sanderson commenting upon this and other cases in relation to the early period of diphtheria at which albumen appears, makes some remarks which command assent.

"The early period of the disease," says Dr. J. Burdon Sanderson, "at which the albumen appears, and the short time during which it lasts are facts full of importance. In case No. 3"—the case now quoted—"the urine was found loaded with albumen eighteen hours after the patient had been apparently in perfect health, the exudation having already appeared on one tonsil. It scarcely needs to be pointed out that such a fact as this does not admit of being attributed to a secondary dyscrasia approaching in its nature to purulent infection. A morbid change of the blood of this nature could only originate *consequently* upon a previous local change, and could not exist without being accompanied by easily recognised considerable symptoms. Setting this aside, the fact only admits of two explanations, either the kidneys must be the seat of the primary morbid process, or the albuminuria must depend on an integral change in the blood. The first supposition is rendered inadmissible by the coincidence of the renal affection with disease elsewhere—that is, in the fauces; so that we are compelled to conclude that the special morbid blood-poison is the primary cause, not only of the albuminuria, but of all the other symptoms. This cannot be better illustrated than by comparing the poison of diphtheria to that of cantharides, which from the moment it enters the circulation manifests its presence by albuminuria, and produces a series of anatomical changes in the kidneys which are identical, as my own observations show with those described by Mr. Simon and Dr. Bristowe in diphtheria."

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[1] Op. cit., p. 194—195.

In the profound disturbance of the nervous system attending the death-agony, the urine, as Gubler and others have stated, is almost always albuminous irrespectively of the nature of the malady of the dying subject.[1] This observation—which I have repeatedly verified in hospital practice—has an interesting bearing on the subject now under consideration. In diphtheria and other poison-diseases there is frequently from the very first a profound disturbance of innervation, to which, as in the death-agony, is chiefly due the imperfect hæmatosis and the consequent albuminous urine at an early stage of these maladies. When, however, the disease has gone on for some time, secondary causes may either originate albuminuria or intensify it if previously existing.

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[1] GUBLER says:—"Sur presque tous les cadavres (et j'en ai examiné un grand nombre sous ce rapport) la vessie renferme de l'urine albumineuse. La généralité du résultat démontre surabondamment qu'il n'a aucune relation directe avec la nature du mal qui a causé la mort. Ce n'est pas non plus l'effet mécanique d'une transudation *post-mortem* opérée en vertu du retrait vasculaire, ainsi que le ferait présumer la viduité des canaux artériels envisagée comme phénomène cadavérique. La filtration albumineuse commence avec l'agonie, c'est à dire, avec les symptômes de paralysie des nerfs vagues chez les sujets dont les urines étaient jusque-là exemptes du principe coagulable, et son intensité croissante est proportionnée à celle de l'embarras circulatoire et respiratoire, ainsi qu'à la durée de cette période ultime des maladies dont la terminaison est funeste. Quand les contractions cardiaques s'affaiblissent et que les poumons s'engouent, quand le *stertor* annonce l'accumulation d'un liquide écumeux dans les voies de l'air et qu'une sueur visqueuse apparait sur toute la surface du corps refroidi et cyanosé, alors des exhalations albumineuses se font de toutes parts dans l'organisme que la

In the semi-suffocative asphyxia of laryngeal diphtheria the mechanically produced embarrassment of respiration and circulation will sometimes, no doubt, cause or increase albuminuria.

The albuminuria of diphtheria, as is well known, is often intermittent. Even when albumen is persistently present in the urine, its amount varies much in most cases, during each twenty-four hours. This variation I have repeatedly observed; but, unfortunately, the observations were not made in a sufficiently methodical manner, nor recorded with sufficient exactitude, to form a basis of speculation far less of induction as to the cause or causes. This I the more regret, as the cause or causes are probably ascertainable by subjecting a few cases to strict observation, and by minutely recording at the time the observations made. The

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vie abandonne. A l'autopsie on découvre parfois dans le péritoine les plèvres et le péricarde des épanchements séreux assez considérables que rien n'aurait fait soupçonner la veille de la mort. La présence de l'albumine dans les urines est un fait du même genre, et s'explique également par la stase sanguine, par l'arrêt du mouvement de composition, et par la cessation de l'hématose." GUBLER: Article ALBUMINURIE; Dictionnaire Encyclopédique des Sciences Médicales, par Raigé-Delorme et A. Dechambre, pp. 482-483, tome ii: Paris, 1865.

urine would have to be examined each time it was voided, a record being made in respect to time of being voided, specific gravity, nature and quantity of the solid constituents, and the amount of albumen, and also of the exact time at which food and medicines were given, the kind and quantity of each being noticed. Except in hospital practice, with organised assistance at command, it is impossible to conduct clinical inquiries of this description; and since my attention has been directed to the cause of the intermittence and variations of albuminuria, the cases of diphtheria which I have seen have all occurred in private practice during periods when imperative work occupied my whole time.

On reading the new and valuable clinical information contained in Warburton Begbie's paper on "Albuminuria in Vascular Bronchocele and Exophthalmos," it occurred to me that there may exist a very considerable similarity both in the essential cause of the albuminuria, and in the cause of its intermittence in diphtheria, and in the cases described by the Edinburgh physician.[1] In both diseases, the discharge of albumen with the urine may be due to the existence of two collateral causes, viz. the disturbed state of innervation, and the altered condition of the blood; and the cause of the sudden variations in the amount of albumen — the remittence or intermittence of the albuminuria — is probably in both diseases the passage into the blood of imperfectly digested ingesta. The imperfect digestion in exophthalmos is often dependent on bulimia, so common a feature in the disease; and in the case recorded by Warburton Begbie, this symptom was notably present. Though there exists usually in diphtheria a condition the very opposite of bulimia—a loathing of food in place of an inordinate craving for it—the assimilative power at a minimum, as is often evidenced by lienteric diarrhœa, and always by rapid emaciation, however much nutriment may be taken. It is easy to understand that variations in the strain put upon the organs of assimilation by the ingestion and digestion of food may cause sudden and transient variations in the time and quantity of the albumen discharged with the urine by a diphtheritic patient.

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[1] "Albuminuria is not a constant symptom of vascular bronchocele and exophthalmos, but it is a frequent one." BEGBIE (Warburton):— 'Albuminuria in Vascular Bronchocele and Exophthalmos,' Edinburgh, *1874*.

A short passage from Warburton Begbie's paper will show the extent of its bearing on albuminuria in diphtheria.

"The form of albuminuria which we are now considering differs from any other form hitherto described, in being limited to the period of digestion of the food. The presence of disease apart from the kidneys is of course conspicuous in vascular bronchocele and exophthalmos, while the peculiar morbid condition of the nervous system, and of the blood-vessels in that disease, as well as the spanæmia which exists, must, I think, be taken into consideration in our endeavour to determine the pathology of the albuminuria, which we now know to be in some way or other associated with it."

"In vascular bronchocele and exophthalmos, there is always present much disturbance of the nervous system: the sufferers from this disease are invariably highly nervous: they are often hysterical. The primary disorder of the circulation, both cardiac and vascular, is of the nature which we associate with derangement of the nervous system. The organs and parts of the body in which local manifestations of disturbance are situated, are organs and parts freely supplied with blood-vessels and blood : the thyroid gland, the spleen which though not invariably, is often affected, and the deep ocular tissues. To these must be added the kidney. From the failure of due nervous influence, the small vessels, and it may be presumed, the capillaries in the thyroid gland, and the deep-seated orbital vessels become dilated, and the circulation through them in consequence interfered with. We can infer from the consideration of the essential nature of the renal circulation, that if an obstruction to the return of blood through the intertubular capillaries and veins exists, either from an obstruction in the heart or lungs, or from a disordered state of the vessels themselves—a condition which I believe to exist in vascular bronchocele and exophthalmos—favoured by the more or less watery state of the blood itself, there will occur a transudation of serum, carrying with it albumen, through the walls of the Malpighian capillaries into the tubes, and thus the urine will be rendered coagulable."

"But in order to explain the limitation of the albuminuria to the period during and after digestion of the food, it is necessary to regard the increased afflux of blood which then takes place as leading to an altered physical relation between the blood and the walls of the vessels, and likewise determining an engorgement of the Malpighian capillaries, while the loss in tonicity in the efferent vessels is thus rendered temporarily more injurious. In other words, the renal circulation in its comparatively tranquil condition is unaffected by the disordered state of the capillaries and small vessels ; but when excited by the stimulus of a recent meal, it is unequal to the task, and the resulting *interference* determines the albuminuria."

No exact explanation, however can be offered with any confidence of the determining cause of albuminuria in diphtheria till we can account for albuminuria being present in some and absent in other cases apparently similar in degree of virulence and similar in the manifestations of that virulence. In the case of E. G. the urine was intensely albuminous: by tracheotomy the semi-asphyxiated patient was snatched from death and ultimately recovered. In another case which I treated in January, 1876, the urine was not albuminous; by tracheotomy the semi-asphyxiated patient was likewise snatched from death, but died fourteen hours after the operation. When treating of the modes of death in diphtheria, the details of this case will be given.

The Significance of Temperature in Diphtheria has been made the subject of careful observations by British and foreign physicians: but as yet only negative conclusions have resulted from these researches. Wunderlich correctly states the sum of existing knowledge on this subject, when he says:—"In no other acute affections has the temperature so little significance as it has in croupous and diphtheritic affections—pharyngeal diphtheria, laryngeal croup, intestinal croup, dysentery, and diphtheritic and croupous puerperal endometritis. One may indeed regard very high temperatures in all these affections as adding very greatly to the danger. But moderate or even normal temperatures do not give the slightest guarantee for a favourable termination. The high temperatures may even decline, whilst the disorder unhaltingly goes on to worse and worse." I have quoted these lines from the New Sydenham Society's Translation of Wunderlich's work on Temperature in Diseases.[1]

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[1] WUNDERLICH (E. A.):—Temperature in Diseases, see p. 367 of New Sydenham Society's Translation: London, 1871.

The translator uses the terms "croup" and "croupous" in the German sense—"croup" in Germany meaning a disease in which false membrane is anywhere formed, and "croupous" meaning *membranous*. Most of the affections named in the passage now quoted are the same disease—*diphtheria*. Diphtheria is diphtheria, and nothing but diphtheria, wherever the locality or localities of its cacoplastic exudation are situated.

Cutaneous Eruptions—some of which resemble certain forms of *the rash of scarlatina*—occur in the course of diphtheria. Their nature and significance have already been noticed, at p. 222, in connection with the diagnosis of the disease, and I propose to recur to the subject in connection with *enlarged glands*.

Enlarged Glands are usual in diphtheria. In describing the case of E. G., I have stated that "some of the glands on both sides near the maxillary angle were enlarged and somewhat tender to the touch" (p. 197). In diphtheritic sore throat I have generally found enlargement of the submaxillary and cervical glands. This circumstance, viewed apart from others, is not of much importance; for enlargement of these glands is a condition commonly associated with various kinds of sore-throat—slight and serious—originating in different causes. It has, however, an important significance when looked at in connection with another fact which I have also noticed, namely, that the axillary and inguinal glands are also often enlarged and tender in diphtheritic sore-throat (pharyngo-laryngo-tracheal diphtheria). Glandular engorgement, therefore, does not belong to *the throat-manifestation*, but to the *disease itself*—to the general disease, diphtheria. Often, I know—as a rule, I believe—the lymphatic system gives early and evident signs of being affected in diphtheria. It is strongly insisted on by Bretonneau as a prominent symptom. Individual idiocyncrasy, however, and the constitution of the prevailing epidemic determine the occurrence of this symptom. Its degree of frequency is probably very variable in different epidemics—a circumstance which probably explains the reason of its not being even adverted to by some of the best clinical historians of diphtheria.

In the epidemics of Florence described by Morelli and Nesti, glandular enlargement is mentioned as a symptom commonly associated with general anasarca and a particular kind of cutaneous eruption.

" In children—the most frequent victims of diphtheria—we often observed," say Morelli and Nesti, " that the skin of the neck and chest presented an eruption of rose-red spots distributed in a particular manner. There was frequently seen in these situations, especially on the lateral and anterior aspects of the upper parts of the chest, red, rose-red, and dark-red isolated points, which, by contrasting in colour with the white surrounding unaltered skin, appeared to be elevated, but on tactile examination proved not to be raised above the level of the skin. This eruption was often seen in cases in which there existed general anasarca, turgescence of the lymphatic glands of the neck, and œdema of the surrounding cellular tissue. The same combination of symptoms has been described by Severinus with exactness, though with that brevity which characterised the great observer of his day." . . . . "The eruption was seen most frequently on the neck and chest: it was occasionally visible on the face, lower part of the abdominal parietes, and thighs—particularly their outer aspect. The duration of the cutaneous maculation seldom exceeded three days, and was sometimes only three hours. On the parts of the neck rendered turgid by extensive glandular enlargement there sometimes appeared a slight transparent rosy blush, which disappeared in a very short time without leaving the least mark or trace. This phenomenon was most frequently met with in the severest and most dangerous cases."[1]

In a case of diphtheria which I saw several times in the Rue du Luxembourg, Paris, in 1872, turgescence and tenderness of the lymphatic glands of the neck, axilla, and groin, were associated with an erythematous scarlatiniform eruption, which, for the thirty-six hours of its duration, gave the patient the appearance of one suffering from scarlatina. The patient, a boy of five years, had several severe paroxysms of glotto-laryngeal spasm, inducing for a short period a condition of semi-asphyxia, and the pharynx and larynx were invaded by false membrane. Nevertheless the air-passage was sufficiently patent to admit a fair amount of air to the lungs, as was shown by the state of the respiration during the intervals between the suffocative seizures. The child died, exhausted, poison-stricken, two days after alarm was excited in the family; and, as far as I could make out, on the fifth day after the earliest symptoms of deranged health and slight sore-throat manifested themselves. The glandular turgescence is often no doubt, like the cacoplastic exudation, the albuminuria, and, the cutaneous eruptions, a direct consequence of the primary diphtheritic toxæmia.

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[1] Op. cit., pp. 16, 17.

Paralytic Affections are common during and after the course of diphtheria. They frequently supervene in a very aggravated form after the disease seems to have run its course, when the patient is apparently in full convalescence. This subject is considered in a separate article.

THE PROGNOSIS IN DIPHTHERIA is always doubtful except in cases which from the first exhibit obvious symptoms of danger. As a rule, in the early stage of the disease, even when the attack is apparently very mild, we must exercise the greatest reserve in forecasting the issue. The general and local symptoms of ultimately fatal cases may for some days have presented nothing to indicate a great deterioration of health, when suddenly the specific exudation, till then limited to a small surface on the tonsils or pharynx, manifests itself in the larynx, rapidly proceeding it may be to the occupation of the trachea and the larger and smaller bronchial tubes; or the mild general symptoms may all at once become serious and abruptly terminate in prostration and death without any great extension of the diphtheritic pellicle; or again, in cases seemingly mild at first, suffocation may terminate life, the rapid formation of false membrane in the larynx mechanically occluding the air-passage, or partly by mechanically preventing the entrance of air, and partly by exciting spasmodic constriction of the glottis. The asphyxia which so nearly extinguished life in the case of E. G. was partly due to spasm, and partly to membranous obstruction; but it was the latter which made tracheotomy imperative.

The prognosis can only be provisional in most cases—that is to say, it must when favorable be made with the reserve that a sudden change for the worse in the character of the symptoms is not unusual. The character of a prevailing epidemic will often be a surer guide to correct prognosis than the symptoms of the individual case. In some epidemics, the prostration is moderate and amenable to average skill in alimentation and medicinal treatment, while the local manifestations of the disease are limited to the pharynx. In some of the milder epidemics of this character—that is to say, epidemics of simple pharyngeal diphtheria—nearly all the patients recover, and that too with very little or without any medical assistance—or it may be, perhaps, notwithstanding the most irrational and rash interference with the progress of the natural cure.

When the larynx and trachea become invaded with false membrane—that is to say, when the case becomes pharyngo-laryngo-tracheal diphtheria—death is the most common termination; but here also the character of the prevailing epidemic must be taken into account. In sporadic cases and in most epidemics the statement now made is corrrect—death is the rule, and recovery the exception. In the French epidemic of 1847, the mortality was computed as 91 in 100 cases. Age exerts a remarkable influence on the mortality—the younger the subject, the greater the risk. This probably arises from two causes: the less power of resisting the morbid poison at an early age, and the narrowness of the larynx in young children.

The basis of prognosis in a case of diphtheria is a knowledge of the duration of the attack at the time of forming the prognosis. The prognostic signification of symptoms, in respect to their nature, grouping, and severity, can only be determined after ascertaining the age which the disease has attained. Diphtheria, like all other poison-diseases, has, it must be remembered, a distinctive natural course to run.

This is not the less true, because it frequently happens that disturbing circumstances occasion divergencies and abrupt arrests before all the posts have been passed.

If the patient at the eighth day of the disease be able to take and assimilate a fair amount of aliment—if also, at the same period, no exudation of cacoplastic lymph into the larynx, trachea, or bronchial tubes have taken place, or having taken place, the false membrane has been ejected and is not being reproduced—the prognosis is hopeful, even although the urine be albuminous, and the action of the heart very feeble. By maintenance of the horizontal position, the judicious use of stimulants, careful alimentation, and the assistance of digestion by pepsine, recovery is likely to take place. Circumstances may likewise render it advisable to add to this treatment, the administration of ferruginous and other medicines; but unless the horizontal position be steadily enforced, and the alimentation be properly carried out, a hopeful prognosis would not be justified by the condition now sketched. Persons in that condition often die suddenly through uncautioned or incautious attendants allowing them to leave their bed, or sit up in bed, to satisfy the calls of nature, when the heart's power is only sufficient to carry on the circulation so long as the patient remains recumbent In point of fact, the reliability of the nurse is a much more important element in the prognosis of diphtheria than in that of most diseases, because in most other diseases death is less apt to occur suddenly from loss of heart-power.

The worst prognostics in diphtheria are incoercible vomiting, extreme prostration occurring early, hæmorrhages, pneumonia, broncho-pneumonia, and the formation of false membrane on the surface of the larynx, trachea, and pulmonary air-passages. Albuminuria is not an unfavourable symptom except as an expression of defective assimilation. Epistaxis is generally the precursor of diphtheritic exudation into the nares. There are few cases, however bad, which the physician is justified in declaring irrecoverable till death has actually taken place. By tracheotomy, by the use of stimulants, or by both measures combined, time is gained, therapeutic opportunities arise, and patients are frequently snatched from the very jaws of death.

The best prognostics in diphtheria are cessation of exudation, increasing heart-power, and improving assimilatory function.

THE TREATMENT OF DIPHTHERIA must be varied in its details according to the nature of each case, the constitutional peculiarities of the patient, and the type of the epidemic. There are, however, certain general principles of treatment which must always be acted on, and the infringement of which may lead to disastrous consequences.

The principles and leading indications of treatment have already been mentioned in a general manner. The subject, however, demands a more detailed exposition.

Even a limited experience will teach an observant practitioner not to expect curative results in diphtheria from particular medicines or vaunted formularies of treatment, but to strive to support life by the measures best suited to each case, rationally using medicines as exigencies and opportunities arise, and not in a routine fashion. The treatment may be conveniently discussed under the two heads, of *general* and *local*.

The *general treatment* has to be considered in respect to *atmosphere*, *food*, and *medicines*.

The temperature of the room ought to vary as little as possible: a temperature of about 17° C. or 63° F. being maintained. The patient ought to be screened from currents of air, care being taken that free ventilation is not interfered with, and that the air is moistened by a regulated escape of steam from a suitably contrived kettle. The arrangement adopted in the case of E. G. answered very well. Nothing can be better for the purpose required than Dr. Pretty's kettle, which is thus described by Sir William Jenner :—"This is a tin kettle with a small aperture at the top closed by a screw instead of a common lid. From the front of the kettle project two spouts of about three feet in length, one spout springs from the upper part of the kettle and passes forward in a straight line; the other spout springs from near the bottom of the kettle and passes obliquely upwards. The lower spout ends in a spoon-like projection, just under the slightly curved down open mouth of the upper spout. The steam passes out of the upper spout, and the condensed vapour drops into the little spoon, and is returned by the lower spout to the bottom of the kettle."[1] A thermometer and a steaming kettle are indispensable in the room of the diphtheritic patient. The maintenance of good ventilation, combined with a moist, warm, and equal temperature, is a paramount necessity when tracheotomy has been performed; and in all cases, and in all stages of cases, in which there exists diphtheritic sore-throat, it is important, as a means of moderating the paroxysms of glotto-laryngeal spasm, that the patient inhale air which is soft, warm, and equable in temperature. Even in the rare cases in which the throat affection is absent, it is the duty of the physician to take the measures best calculated to secure in the sick room such an atmosphere as has been described; for in such cases the disease may at any moment manifest itself in the air-passages.

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[1] JENNER (William) :—Op. cit., p. 67.

The support of life by stimulants and aliments—the feeding of the patient—is universally stated to be an essential element in the treatment of a case of diphtheria. Neither alimentation nor tracheotomy were curative agents in the case of E. G., nor in any case of diphtheria can they be so regarded. Nevertheless, they were the principal means by which E. G. was saved from death, and by them indeed is recovery chiefly rendered possible in all such cases. Success in alimentation and success in tracheotomy are only means by which we gain time, by which we support life, for a period, we hope, of sufficient duration to enable the disease to run its natural course, guided and aided by us whenever therapeutic opportunities arise.

It is necessary to insist emphatically upon the fact, that in the treatment of diphtheria there is nothing approaching alimentation in importance. Unfortunately, however, this knowledge is too often of very little importance to physicians and patients in bad cases, for in such there is almost no power of assimilation, and there is likewise extreme difficulty in inducing the patient to take food, or having taken it, for him to retain it. Diphtheria-stricken subjects loath food, and children often struggle violently against attempts to feed them. When food is swallowed, it is often rejected immediately. The difficulties in the way of feeding are always great and sometimes they are insuperable, but still they must be resolutely faced. The alimentation of diphtheritic patients requires great skill, tact, and, I might almost say, inventive power on the part of the medical attendant, assisted by the co-operation of a well-disciplined, conscientious, and obedient nurse. Each case has dietetic difficulties which are its own, and must be met from hour to hour as they arise.

While, therefore, it would be tedious to go into details, a short statement of the practical principles which require to be carried out may be briefly stated. Pounded raw beef in very small quantities, moistened with the juice of underdone roast beef, is generally the best basis of alimentation. It will seldom be expedient to administer more than one teaspoonful at a time, and not nearly so much if there be nausea. With the raw beef and other aliments, a little *pepsina porci* ought to be given from time to time. I have seen the difficulties of alimentation much diminished by the judicious addition of pepsine to the food. Together with the raw beef and other aliments we must give stimulants liberally: the exact quantity must be determined by the exigencies of each case, and will be subject to frequent variations. As a general rule, however, it is well to remember that brandy is well borne in diphtheria by patients of all ages. Its effects require to be carefully observed in young subjects; but it may be accepted as a fact, that children bear brandy, sherry, and all spirituous stimulants exceedingly well. Proofs of the accuracy of this statement constantly present themselves in practice, both in respect to diphtheria and other diseases.

"When," says Sir William Jenner, "the disease begins with marked feebleness of pulse, dusky redness of throat, and extreme sense of general weakness, wine in full quantities is required at an early period. From six to eight ounces of sherry or port for an adult, and as good a diet as the patient can take, must be given from the first. In the course of the disease much larger quantities of wine, or a proportionate quantity of brandy, may have to be given. Of course, the quantity of stimulant must be regulated by the age and habits of the patient, as well as by the character and the stage of the disease; but remember that, as a rule, young children bear and take with advantage in diseases of depression much larger quantities of stimulants than you would probably suppose. A child of three years of age, now under treatment for diphtheria at the Children's Hospital, is taking with apparent advantage one to two drachms of brandy every hour, *i. e.* from three to five ounces of brandy in twenty-four hours."[1]

When we have nausea and vomiting to contend with, we must chiefly trust to brandy and pounded raw beef (duly pepsinated) as the dietetic articles most fitted for keeping up life. When the stomach will bear more bulky food, it is always useful to give a variety of suitable aliments, among which may be mentioned milk, egg-flip, and panada. As soon as it can be borne cod-liver oil ought to be given. It has a wonderful power in restoring the wasted tissues.

There is very little if any scope for the administration of medicines when a case of diphtheria is at its worst. Till the fury of the disease has spent itself, it is wise to give as little medicine as possible, and never to give any at all unless the indication be clear and positive. When there is nausea and vomiting, we may hopefully give oxalate of cerium or creasote, but we must avoid, on account of its depressing influence on the heart, the other great remedy for irritability of the stomach—hydrocyanic acid. As soon as the patient can digest it, iron in some form ought to be given in very small doses. It may be very usefully combined with a syrup of the phosphate of lime. Ferruginous medicines are urgently demanded from the very dawn of convalescence by the anæmic aspect of the patients, while cod-liver oil and phosphate of lime are equally called for by their emaciated appearance. Building up treatment, alimentary and medicinal, is most useful in preventing or moderating the paralytic affections incident to advanced convalescence.

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[1] JENNER (William):—Op. cit., pp. 67, 68.

There is no specific medicine for diphtheria—there is no way of curing that disease; but there are many medicines and many measures of signal benefit to diphtheria-stricken patients, by the skilful use of which they are often enabled to recover.

With general means it is sometimes proper in laryngotracheal manifestations of diphtheria to use local treatment to dislodge or dissolve the false membrane. The treatment by emetics adopted for the former purpose is local in its intention, but general in its action on the patient.

Emetics in diphtheria are seldom of much use; but still there are many cases in which it is right to try dislodgement of the false membrane by their employment. The emetics which ought to be selected are those which do not depress, and which act quickly. Perhaps sulphate of zinc is the most, and tartar emetic the least suitable. The latter is not only unsuitable, but is pretty certain to prove dangerous by its depressing action. Speaking of tartar emetic as an emetic in diphtheria, Trousseau says:—"The selection of the particular emetic to be employed is not a matter of indifference. Tartar emetic so lauded by some seems to me to be the most dangerous of all emetics." . . . . "It often causes formidable symptoms, such as obstinate vomiting and choleriform diarrhœa. It causes extreme prostration and often accelerates death."[1] Trousseau's teaching, unfortunately, is not universally followed in this matter, as I have had several occasions to observe. The following instance is confirmatory of Trousseau's statement. All the circumstances being remarkable are accurately remembered by me.

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[1] TROUSSEAU:—Op. cit., vol. ii, p. 578.

On a summer morning in 1875, I accompanied my friend Dr. Borthwick of Dumfries on a visit to one of the great hospitals of Paris. During a long drive to the hospital, the chief subject of our conversation was the pathology and treatment of diphtheria in relation to emetics and tracheotomy in the laryngo-tracheal manifestation of the disease. We knew nothing of the cases we were to see. On our arrival we entered a medical ward where a physician was examining the first case of diphtheria, we were told, which had been received into the hospital during the current year. The sick man, aged about forty, was sitting on his bed half dressed, a circumstance explained by his having just returned from the privy situated outside the ward. We ascertained that he had been about forty hours in the hospital; but did not learn the previous duration of his illness. Since admission, he had had low diet and no stimulants. He spoke in a husky whisper. He had had no stridulous breathing. From his replies to questions, we ascertained that he chiefly complained of dyspnœa, diarrhœa, loathing of food, and debility. The visible part of the interior of the throat was covered with false membrane; and the physician announced, after applying the stethoscope, that he heard semi-detached false membrane flapping in the trachea. The treatment prescribed consisted in a continuance of the antiphlogistic regimen, and the exhibition at short intervals of tartar emetic in doses of ten centigrammes. I do not know whether it was the prescriber's object to obtain the dynamic action of the drug, or whether its emetic effects were looked to as a means of dislodging the false membrane from the air-passages. Before we left the ward, the patient went to and from the privy with tottering steps. The exertion induced extreme vital depression—unaccompanied by stridulous breathing, or increase of dyspnœa. Dr. Borthwick and I agreed that the only chance—and that a very small chance—of recovery which this man possessed, consisted in his being kept in the horizontal position, and liberally dosed with brandy, an emetic of sulphate of zinc being delayed till a rally should occur, and tracheotomy being resorted to only if it should be demanded by threatening asphyxia. We were equally agreed that under the combined depressing influences of diphtheria and antimony, it was not likely that the patient could survive more than a few hours. Our evil prognosis was correct, for the patient died in a state of collapse six hours after our visit.

The tartar emetic treatment of diphtheria has been generally regarded as one of the wildest heresies in the practice of medicine, though some able men of large experience think and teach otherwise.

In 1859, during the prevalence of a severe epidemic of diphtheria at Paris, three cases were reported as having been treated successfully by Bouchut at the Sainte-Eugénie hospital, by large doses of tartar emetic. The three patients took the medicine according to the following formula:—Tartar emetic, 75 centigrammes; syrup of poppies, 15 grammes; and gum-water, 100 grammes. Mix. Half a tablespoonful to be taken every hour. The quantity intended to be taken in a day was from 50 centigrammes to a gramme—that is, from 7¼ grains troy to 15½ grains troy of the tartar emetic. There were two objects in view—the excitation of vomiting as a means of getting rid of the false membrane, and the mastery of the disease by the production of successive dynamic shocks. It is stated that the nurse, observing one of the three patients in a suffocative paroxysm from the presence of laryngeal false membrane, gave a double dose of the mixture with the addition of some tepid water. Forthwith, the child, in a violent vomitive effort, ejected a tubular membrane two inches in length.[1] The incident is interesting, but it does not tend to justify the administration of tartar emetic in laryngo-tracheal diphtheria. Would it not have been equally efficacious, and much safer to have administered an emetic dose of sulphate of zinc followed by some brandy to sustain the feeble heart during the vomitive crisis?

Tracheotomy, through the opposition of the family, was too long delayed in the case of E. G. A similar difficulty often occurs in private practice. Each case has to be decided on its own merits; and the physician in charge must be in constant readiness with his instruments and appliances to perform tracheotomy at very short notice. In the majority of cases the actual crisis is sudden, and there is no time to divide responsibility with a colleague. The patient must not therefore (if the attendant can help it) be put in jeopardy by waiting for a formal consultation, or till a surgeon can be found to admit oxygen to the craving lungs. On the other hand, if time permit, there is no emergency in medical practice in which it is more for the advantage of patient and practitioner that there should be a division of responsibility, and a collation of opinions.

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[1] BOUCHUT:—L'Union Médicale, for 5th April, 1859.

In the diphtheritic semi-asphyxiated child, tracheotomy is an operation requiring great care and a good light. There is no surgical difficulty, but the operator, if unaccustomed to use the knife, must be cautious. Nay, even an expert requires to proceed slowly, for children with turgid necks have been lost from hurried tracheotomy, performed with imperfect light, by good operators. The difficulty and danger of tracheotomy in diphtheritic children arise from the turgidity of the veins of the neck caused by the state of semi-asphyxia. The sudden gush of venous blood which occurred in the case of E. G. illustrates this remark and confirms its correctness.

The patient ought to be placed on his back on a table, with a narrow solid cushion so adjusted under the neck as to project and stretch the trachea. A quart botttle wrapped up in wadding, or in anything at hand, answers admirably. This being arranged, the operator, with the least possible delay—for the patient's position is a very trying one—makes an incision through the skin, in the mesial line, from the cricoid cartilage nearly to the sternum. The tissues ought then to be divided layer by layer, the gorged veins being carefully avoided, and the muscles and vessels being held to each side by the fingers of the left hand of the operator or by two blunt hooks held by an assistant. When the trachea has been laid bare, a small incision is made in it, close to the cricoid cartilage, with a sharp-pointed bistoury, after which a probe-pointed bistoury is employed to complete the necessary opening. By means of the tracheotomy dilator, or if that be not at hand, by means of a common dressing-forceps, the opening is dilated, and the operation completed by introducing a double canula, and then fastening it behind by tapes.[1] As in the case of E. G. it may be necessary to draw out detached portions of false membrane before the canula can be introduced. In such cases, it is well to keep the opening dilated till the false membrane and mucosity have been got rid of by coughing or otherwise. The inner canula in some cases requires to be frequently removed and cleansed from obstruction. For such emergencies and for such occurrences as the grave accident which befel E. G. on the third night after the operation, a reliable attendant must be ready to intervene at a moment's notice.[2]

Another method of performing tracheotomy in diphtheria has been recently proposed by Saint-Germain, one of the surgeons of the Hôpital des Enfants Malades of Paris. The object in view is to avoid hæmorrhage from cutting the engorged veins. A red-hot, probe-pointed bistoury is the instrument employed. It is used in the first instance to burn through the skin, intervening tissues, and crico-thyroid membrane; and then by using the cutting edge, to divide the cricoid cartilage and a few rings of the trachea. With the aid of Labonde's dilator, the canula is then introduced.

Tracheotomy, like venesection and the use of the stomach-pump, is a mechanical service which every one who assumes the responsibilities of medical practice ought to be able to render to his patient at once, whenever the emergency arises. The question is not whether tracheotomy belongs to medicine or to surgery—that is of secondary importance—but whether every man ought not to save life when he can do so by the use of his hand. It is expedient that some should specially cultivate medicine, and others specially cultivate surgery; but it is a great scandal when a physician in certain emergencies refuses to use the surgical knife, and when a surgeon in certain emergencies refuses to write a medical prescription.

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[1] It is not safe to operate without skilled assistance unless prepared single-handed to tie vessels accidentally wounded. This is easily managed by being provided with two or three of the short light artery forceps made for service in such special emergencies. During the late war, relying on those instruments, I repeatedly performed considerable operations without skilled assistance, by instantly securing the vessels as they were divided, and applying the ligatures when most convenient.

[2] See p. 203.

Local applications intended to destroy, detach, or dissolve the false membrane in laryngo-tracheal diphtheria are in favour with many. Fortunately they are not so much relied on now as they were by Trousseau and those who wrote by his inspiration. This change of opinion is, as yet, more apparent in the conversation and current practice of French physicians than in their published works. It is now generally admitted that Trousseau attached an undue, and even a dangerous importance to destroying by caustics the false membrane as soon as it appeared on the pharynx and on any part of the visible mucous membrane of the throat. His statement that the destruction of the false membrane not only prevented the spread of the local mischief, but even arrested the career of the general disease itself, is now denied by most French clinicians of repute. This change of opinion is fortunately likely to be permanent; for it has been clearly shown, and is now generally believed, that caustics, strong acidulated washes, and active chemical solvents act mischievously by irritating the mucous membrane, and so exciting increased exudation of cacoplastic lymph.

Gargles, washes, and various other applications, if not of an irritating character, may be used with impunity, and sometimes with benefit. Some of them tend to promote separation of the false membrane, without producing any rawness or hurtful irritation of the subjacent mucous membrane. The advantage derived from them is, we must remember, frequently temporary, and more apparent than real. So long as the disease is in the exudation-stage, layer after layer of false membrane will continue to be deposited on the surface of the mucous membrane; and the rapidity with which this reproduction proceeds may more than counterbalance the benefit derived from the separation of the upper strata. It follows, therefore, that the only topical applications to be used are those which do not irritate.

Among the safe, and more or less useful topical applications I may mention glycerine of borax (of the Br. Ph.)—lime water—a very diluted solution of hydrochloric acid in distilled water—and a solution of one drachm of neutral sulphite of magnesia or neutral sulphite of soda in eight ounces of water.

Dr. Wagner, of Friberg, employs a gargle composed of one and a half parts of salicylic acid, fifteen parts of spirits of wine, and one hundred and fifty parts of water. He uses salicylic acid internally in diphtheria, in doses of from two to four grains given every two hours.

Dr. Hanow, of Erlangen, also prescribes salicylic acid internally in diphtheria. He reports six cases successfully treated by the administration every hour of from one to two teaspoonfuls of a mixture composed of eight grains of salicylic acid, seventy-five grains of phosphate of soda, and four fluid ounces of water. He says that after the third or fourth dose, the diphtheritic masses began to separate rapidly, the fever disappeared, and in twelve hours recovery was established.[1] It would have been curious, and perhaps instructive, to have observed some of this physician's supposed cures of diphtheria by salicylic acid.

My friend, Dr. Young, of Florence, who has had large experience of diphtheria in the city where he resides, when visiting Paris in October, 1875, informed me that of all the numerous local measures which he had tried, there is none on which he so much relies as throwing into the throat every hour, by means of a ball spray apparatus, a solution of three drachms of lactic acid in eight ounces of lime water. In a letter with which he has since favoured me in reply to my inquiries, he gives details of his experience in respect to local throat-treatment.

"If," says he, "there be much swelling and tenderness of the glands at the angle of the jaw, I generally cause to be spread over the glands the *Unguentum Hydrargyri* of the British Pharmacopœia diluted with an equal quantity of lard, directing likewise bags filled with very warm bran to be kept constantly applied round the throat. These measures often afford great relief and diminish the glandular swelling. In the 'catarrhal' form the solvent effects of the lactic acid become visible in from six to twelve hours. The scattered patches gradually thin away at the edges, and the coughing which usually follows the use of the spray, brings away small shred-like pieces of the soft thin membrane. The mucous surface beneath is invariably healthy; but occasionally its vessels are more prominent than is natural. There is no erosion. The case seldom continues more than five or six days. In the 'fibrous' form the process of recovery is slower, and the membrane manifests strong resistance to the acid. After the use of the spray—for about twelve or eighteen hours—the mucous membrane becomes less swollen and the congestion of the vessels is confined more closely around the false membrane. The patches become prominent and their edges sharply defined. They now gradually loosen, and with an effort of coughing come away, leaving an injected condition of the subjacent surface. Sometimes, however, when the acid has been more frequently used the membrane is forced away by the act of coughing without undergoing the above-mentioned preparatory stages, and in these cases there is usually considerable bleeding from the surface of the mucous membrane, but I have never seen the false membrane re-form on those bleeding spots, whereas if the membrane be torn away the exposed bleeding surface becomes in two or three hours the seat of fresh deposit. The 'inflammatory' form is more intractable. The spray usually causes more irritation, and is therefore less easily borne. If used at the very commencement when the deposit is soft and creamy, the first effect of the acid is seemingly to harden the layer. When this takes place there is usually no further progress of the disease, the patches gradually become raised at the edges and slowly loosen. There is often pus found beneath the patch when it comes away. If the case is not seen till the creamy layer has assumed the tough wash-leather appearance, the difficulty of solution is greater. The membrane does not only longer resist the action of the acid, but the general inflamed and œdematous condition of the tonsils, uvula, and palatine arches continues, while the fine streaks of yellowish secretion are rapidly appearing on other parts. The inhalation of steam as hot as can be borne is serviceable at this stage. In several cases the tough patches on the tonsil broke up and came away in two or three pieces, while in others the early signs of improvement consisted in the gradual diminution of the inflamed condition, and the clearing away of the fine streaks by solution before they were allowed to coalesce and form larger pieces."

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[1] DOBELL (Horace):—Annual Reports on Diseases of the Chest, vol. i, p. 55, London, 1875.

Notwithstanding much that has been ably written in a contrary sense, I give in my adhesion to the views which now begin to prevail in France in respect to the local treatment—that very little advantage is derived from it, and that it is often exceedingly mischievous. Moist warmth applied externally to the throat gives much comfort and is in no way injurious: only soothing or, at least, non-irritating internal local applications are, I think, admissible.

Before speaking of the Pathology and Morbid Anatomy of Diphtheria, three topics of clinical interest claim notice, viz. the *manner in which diphtheria is communicated; the frequency with which lumbrici exist in persons attacked with diphtheria; and the modes of death in diphtheria.*

THE CONTAGIOUSNESS OF DIPHTHERIA has been fully established. The degree, however, in which the disease is contagious, differs with the idiosyncrasy of individuals, and with the constitution of epidemics. In a large number of persons, the contagium—whatever that may be—does not find a congenial soil. The splutter of mucosity and membranous shreds often received on the face and into the mouth during the exploration of the throat or during the operation of tracheotomy may or may not be fraught with poison to the physician and others in attendance on the patient; but assuredly the cases are so many, and so accurately reported in which persons have been mortally stricken in this way, that the propriety of such precautions as were taken when the trachea was opened in the case of E. G. are always imperatively demanded. Trousseau and others adduce facts which proclaim to our profession the necessity of self-protective caution in ministering to patients affected with laryngo-tracheal diphtheria, even when the malady exists in a mild form.

"One," says Trousseau, "of my much lamented hospital colleagues whose name is known to all of you, and whose works many of you possess—Valleix—was in attendance upon a little girl suffering from membranous sore-throat. She recovered from this affection, which was not of a severe character, under energetic treatment adopted by my unfortunate colleague. One day when examining the throat, he received into his mouth a small quantity of saliva spurted out by the patient in coughing: he got the disease. Next day, on one of his tonsils, there was a small pellicular deposit: he had slight fever: and some hours later both tonsils and the uvula were covered with false membrane. Soon afterwards there was a profuse discharge of serous secretion from the nose: the cervical glands, and cellular tissue of the neck, and intermaxillary region were a good deal swollen: delirium supervened, and in forty-eight hours Valleix died without having had any laryngeal symptoms."

"Very recently one of my provincial colleagues had a case of diphtheria and croup in which he was obliged to resort to tracheotomy. During the operation, a fear of suffocation arose from blood getting into the trachea, whereupon, in dismay, my imprudent colleague applied his mouth to the wound in the neck; out came the blood from the air-passages: he inoculated himself with the disease. Like Valleix he died in forty-eight hours of malignant sore-throat, the symptoms including the delirium having been similar."

"To these lamentable cases I have yet to add others equally sad. Under very similar circumstances, my friend and colleague Dr. Blache had the sorrow to lose his son, one of the most distinguished hospital *internes*, a youth of great promise, in whom the charms of intellect were united to the most solid information. Henri Blache was put by his uncle Dr. Paul Guersant in charge of a child suffering from croup, on whom tracheotomy had been performed. He passed three nights with the child. At the end of the third night, he felt slight pain in the neck, and went home to mention it to his father. Dr. Henri Roger, Dr. Legroux, and I were immediately sent for. We found the unfortunate young man in a very feverish state, and his tonsils covered with false membrane. Within a few hours, the swelling in the neck became enormous, an incessant discharge from the nose was established: delirium set in at the end of the first day: and after an illness of seventy hours our patient died without having had the slightest affection of the larynx."

"Thus, gentlemen, you see that a special form of diphtheria may be contracted by contact with an individual suffering from the ordinary form of diphtheria, just as confluent smallpox may be taken by contact with one who has only the distinct form of the disease."[1]

Swallowing, or otherwise receiving the contagium into the body is not enough to propagate the disease. The seed does not necessarily germinate: there must be an aptitude in the recipient soil. This aptitude belongs to some families and some individuals; and does not belong to other families and other individuals.

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[1] TROUSSEAU:—Clinical Lectures: New Syd. Soc. Translation, vol. ii, pp. 497—498.

Dr. Amerigo Borgiotti has compiled a very interesting table showing the double and triple deaths in families which occurred from diphtheria at Florence from June, 1871, to March, 1872, during an epidemic. It will generally be regarded as strong evidence of the essentially contagious nature of diphtheria. At the same time, the frequency with which diphtheria desolates particular families may be partly explained by the existence of a family diathetic aptitude to receive the contagium of diphtheria. However explained, the facts embodied in the subjoined table show that, in an epidemic of diphtheria, it is to diathetic as well as to epidemic influence that the dissemination of the disease is due.

Diphtheria in its milder forms is either not contagious or only in a slight degree; but it is clearly proved by the subjoined table, and the facts collected by Trousseau, that malignant, or what has been popularly called "real" diphtheria is propagated by contagion from person to person. This statement is incontrovertible, and is not invalidated by the numerous negative experiments which have been performed.

Borgiotti's tabular statement of double and triple deaths in families from diphtheria from June, 1871, to March, 1872.

Date.	Name.	Age.	Residence.
1871.			
June 16	Hager (Luisa)	3	Via Militare.
	,, (Emilia)	4	Ditto.
14	Giachetti (Mario)	5	Via delle Ruote.
21	,, (Guilio)	3	Ditto.
24	Carovani (Giorgio)	3	Via S. Zanchi.
	,, (Carlo)	4½	Ditto.
27	,, (Ida)	6	Ditto.
July 8	Bachetti (Filoleonte)	6	Via della Fortezza.
11	,, (Emilia)	4	Ditto.
27	Smorti (Alfredo)	6	Via della Chiesa.
Aug. 15	,, (Raffaello)	7	Ditto.
Sept. 10	Cagnoni (Guido)	6	Prato dell' Isola.
	,, (Oreste)	8	Ditto.
17	Galli (Natalina)	4	RR. Scuderii.
20	,, (Umberto)	3	Ditto.
27	Ricci (Guido)	4	Via S. Zanobi.
	,, (Matilde)	6	Ditto.
23	Cicali (Pietro)	8	Via Valfonda.
28	,, (Blanca)	3	Ditto.
29	,, (Ernesta)	6	Ditto.
7	Pecori (Giuseppe)	8	Alle Campora.
18	,, (Luisa)	6	Ditto.
27	Lippi (Guilia)	8	Piano di Guillari.
Oct. 2	,, (Tito)	3	Ditto.
10	Lenzi (Ida)	8	S. Donato.
13	,, (Isacco)	6	Ditto.
Nov. 25	,, (Zaira)	7	Ditto.
Oct. 12	Puliti (Luigi)	11	Via Aretina.
13	,, (Isolina)	4	Ditto.
Nov. 7	Torrigiani (Emma)	3	Porta Rossa.
8	,, (Guido)	2	Ditto.
6	Persico (Luigi)	14	Via Tornabuoni.
13	,, (Giovanni)	8	Ditto.
20	Luci (Irene)	8	Via Aretina.
22	,, (Gemma)	6	Ditto.

Date.	Name.	Age.	Residence.
Nov. 16	Aloisi (Amalia)............	32	Atta Querce.
Dec. 16	,, (Amelia, daughter)	5	Ditto.
9	Civita (Amedeo)	3	Via dei Fossi.
11	,, (Adolfo)	8	Ditto.
Oct. 31	Palazzi (Bianca)............	6	Via Frusa.
Nov. 6	,, (Virginia)	5	Ditto.
28	Massai (Aurelio)	3	S. Gallo Soc. Edificatrice.
1872.			
Jan. 22	,, (Matilde)	4	Ditto ditto.
Feb. 5	Visibelli (Maria)	3	Via Borgo Allegri.
16	,, (Narcisa)	4	Ditto.
9	Gallone (Amelia)	4	Via S. Gallo.
9	,, (Maria)	3	Ditto.
6	Fanfulli (Enrico)	5	In Camerata.
15	,, (Egisto)	6	Ditto.
19	,, (Rosa)	40	Ditto.
5	Manescalchi (Annunciata)	4	Via Pisana.
16	,, (Maria)	11	Ditto.
Jan. 25	Allessandri (Guilia)	5	Costa S. Giorgio.
Mar. 2	,, (Giovanni) ...	13	Ditto.
Jan. 3	Testi (Guido)...............	3	Via de' Renai.
Mar. 9	,, (Federigo)	7	Ditto.
Feb. 29	Corsini (Bice)...............	5	Orti Oricellarj.
Mar. 3	,, (Virginia)	4	Ditto.

This table shows that twenty-two times there were two deaths in one family, and that five times the two deaths occurred on the same day. Three times there were three deaths in the same family.

Is Diphtheria communicable from man to the inferior animals?—In a communication to the 'Lancet' (24th April, 1875) I directed attention to a case recorded by Professor Bossi and to the question of diphtheria being communicable from man to the inferior animals. At the same time, I stated that there is some reason to believe, that during epidemics of diphtheria in man, diphtheria and diphtheritic croup occur in the lower animals.

The remarkable case observed by Professor Bossi is thus described by him in the *Giornale di Medicina Veterinaria Pratica d'Agricoltura* :—" A friend," says Professor Bossi, " who had lost a little boy by diphtheria, after a few days' illness, requested me to visit a very beautiful small-breed greyhound, about one year old, which had fallen ill four days after swallowing some of the child's excrement, and some remains of food which had been served to him.[1] On making a careful examination of the dog I found that it was in a state of great prostration ; that it had a languid look ; lachrymant eyes ; open mouth, copiously discharging a viscid fluid ; quick, sibilant breathing ; hoarse voice ; full, hard, rapid pulse ; the neck so stretched as to be almost rigid ; and difficulty in deglutition. By digital examination, I found that the throat was œdematous, and the seat of severe pain. On opening the mouth, which was not an easy operation, I found that the mucous membrane of the fauces was red and swollen. I observed two ulcerations, one of which was on the veil of the palate and the other on the right tonsil ; the latter was of some size and depth and had elevated edges. A conjunct view of the symptoms and appearances led me to conclude that the disease under which the dog was suffering was diphtheria, or, to use a better form of expression, pseudo-membranous laryngo-pharyngeal angina. The dog died, on the third day, from suffocation, after having had some convulsive movements. At the necropsy, the mucous membrane of the fauces was found in a pulpy state, and denuded of its epithelium. Here and there, the membranous exudation presented the appearance of compact, thick, adherent excrescences. The ulcerations were blackish, and very deep. The inflammation extended to the mucous membrane of the pharynx and larynx. The heart and lungs, which presented a blackish, flabby appearance, contained pitch-like blood, and several fibro-albuminous concretions."

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[1] The manner in which the dog received the diphtheritic contagium is thus described in the original :—" Cane levriere......che si ammalò quattro giorni dopo aver trangugiato alcuni emessi escreati dal ragazzino, non che degli avanzi di alimento dello stesso."

I have translated Bossi's case from the original Italian, as quoted—apparently verbatim—by Leopoldo Nesti. at p. 230 of *Lo Sperimentale* for 1872.

This case is not recorded sufficiently in detail to admit of its being critically examined with that searching minuteness which its importance merits. It cannot, therefore, be accepted as in itself *proving* that diphtheria is transmissible from man to the lower animals, although it must be ranged with those facts which render it *exceedingly probable* that when the subject shall have been fully investigated clinically and experimentally, it will be found that the disease is transmissible from the human subject to the lower animals.

To clear up the subject, a well-planned series of experiments on dogs and other animals is called for; and also, a careful observation of the diseases of the lower animals occurring within the geographical area of epidemics of diphtheria in the human subject.

If Bossi's narrative be reliable, it supplies a strong argument in favour of the germ or fungus theory of diphtheria—a theory which is maintained by most Italian and by many German physicians.

Hueter—a physician of Erlangen—states that he has produced diphtheria in rabbits by introducing into their dorsal muscles diphtheritic membrane taken from the human subject. A reviewer in the British and Foreign Medico-Chirurgical Review for January 1876 gives the following interesting notice of Hueter's researches:—"Hueter reconciles all the phenomena of croup and diphtheria with the parasitic theory he has adopted, and he ingeniously argues that if any difference exists between the two affections, it depends upon the greater or less activity of the monads, which are the agents in both, in penetrating the mucous membrane. If these monads sink deeply into the tissues and enter the circulating fluids, the disease attacks the whole system, and is *diphtheria*, but if they have less penetrating power and rather tend to pass to the surface, the disease is *croup*. But after a very minute and almost wholly hypothetical explanation of the parasitic theory, the author concludes by observing that all the differences described by others and by himself, may be explained by supposing the reception in the tissues of an infectious matter which is different in degree, but identical in its nature. He states that he has succeeded in proving, experimentally, the identity of the croupous and diphtheric membrane, for when both were inserted into the dorsal muscles of a rabbit they produced the same form of diphtheric myitis which killed the animal."[1]

WHAT RELATION DOES DIPHTHERIA BEAR TO LUMBRICI?—Among the various circumstances which may mask the invasion of diphtheria particularly in children, is the concurrent manifestation of symptoms due to worms.

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[1] HUETER:—Tracheotomie und Laryngotomie. Handbuch der allgemeinen und speciellen Chirurgie. Erlangen, 1872. (Reviewed with other works.)

Lumbrici—Morelli and Nesti affirm—*were almost a*
found in the intestinal canal, in their autopsies of pe
dying of diphtheria at and near Florence in the epid
from 1862 to 1872.[1] In their work, they give the
tory of fourteen autopsies of diphtheritic cases occu
in their own practice, and of three cases the deta
which were communicated to them by other physi
of Florence. In one only of their own fourteen
(Zaira M.) was the intestinal canal not examined.
seven of the remaining thirteen cases lumbrici were f
In Eugenia di S. R., two lumbrici were found in the
intestine. In Guilia, two lumbrici were found in
intestinal canal. In Agabo L. two lumbrici were foun
the intestinal canal. In the intestine of Ruggero C.
were three lumbrici. In the intestinal canal of Attil
eight lumbrici were found. In the intestinal can
Bianca F. three lumbrici were found. In the intes
canal of Giovannina M. were seven lumbrici, one of w
was alive at the autopsy, thirty-six hours after d
Guido di L. B. had fourteen lumbrici, one of which
taken from the larynx after the patient's death.

The frequency with which Drs. Morelli and Nesti f
lumbrici in the intestinal canal of patients who had
cumbed under diphtheria is a fact which deserves atten
Lumbrici, however, are so very common, that it w
require a great deal of evidence to prove any special con
tion between them and diphtheria.

Was the frequent coincidence of lumbrici and dipht
a peculiarity of the ten years of diphtheria in Florence

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[1] MORELLI AND NESTI: — "Che quasi costantemente esist
lombricoidi nel contenuto intestinale." Op. cit. p. 102.

not, is the coincidence a peculiarity of particular seasons, places or persons? Is the coincidence more, less, or equally common in sporadic and epidemic cases? In the mean time, the facts are too few to furnish answers to these questions. We cannot as yet proceed beyond the fact that in respect of the epidemics at Florence described by Morelli and Nesti, there existed a remarkable number of cases in which lumbrici and diphtheria coexisted in the same subject.

It is an undoubted fact that a special aptitude to receive the poison of diphtheria belongs to certain individuals, and to certain families, in a much higher degree than to others; and also that certain districts, streets, and even particular houses in a street, receive repeated visits from diphtheria within a period of a few years, while habitations in immediate contiguity all around enjoy immunity from the disease, although they are apparently similar, or even—as is often the case—inferior in what are called sanitary conditions. There is evidently an unknown something in particular persons and places for which diphtheria has a decided liking; and it is quite reasonable to suppose that the same unknown something may be liked by lumbrici. Parasites as well as zymotic diseases have strong likings and dislikings for persons and places.

When I read the observations of Morelli and Nesti, I remembered my having found three lumbrici in the intestinal canal of the child whose case is described at p. 213, the child whose immediate cause of death was an intense pulmonary manifestation of diphtheria. This child passed several lumbrici two months before his diphtheritic attack.

THE MODE OF DEATH IN DIPHTHERIA is chiefly determined by the degree of the virulence of the poisoning —the duration of the case—and the presence or absence of obstruction of the air-passage by false membrane.

In cases of intense virulence, it sometimes happens that death takes place within six or eight hours of the patient having given the first signs of being stricken by illness. Failure of the action of the heart is the cause of death in cases of this description. Sometimes the fatal issue occurs suddenly as the immediate result of cardiac syncope, and at other times by a process of rapid sinking consequent upon a profoundly feeble circulation. This sinking may be either intermittent or continuous.

In all cases of diphtheria and in all stages of the disease —even during an apparently satisfactory convalescence— failure of the action of the heart is an ever-to-be-dreaded cause of death. In many cases it is impossible to guard against it by the utmost watchfulness and the highest exercise of precautionary skill. On the other hand, by judicious care, sound precautions, and rational treatment, cases of extreme cardiac debility are frequently guided to complete recovery.

A child of eleven years of age—an English girl—was treated in the summer of 1872, by another physician and myself, for severe pharyngeal diphtheria characterised by great depression of the vital powers. In this case, the false membrane never extended beyond the pharynx and tonsils. A month had elapsed since the first manifestation of the disease: its acute symptoms had passed away:—and although there still remained great debility and emaciation, with a slight and perhaps increasing difficulty in swallowing liquids, improvement in the countenance was visible from day to day. Notwithstanding the dysphagia referred to and persistent emaciation, matters seemed to be rather tending to a favorable issue under the influence of a pepsinated alimentation and the ammonio-citrate of iron and quinine taken in doses of two grains three times in the twenty-four hours. In this hopeful state of the case—a month from the beginning of the attack—the nurse was permitted, on a beautiful summer's afternoon, to carry the patient to a garden adjoining the house. The child was carried from bed to the garden, and back from the garden to bed. When in the garden, she rose from the couch on which she was lying, walked a few steps to an adjoining flower-bed, picked some flowers, and shuffled back to her couch on which she fell back exhausted, but immediately rallied on drinking a few mouthfuls of brandy and water. When carried back to bed she was in good spirits and seemed in all respects stronger and better than when taken into the open air. She had been laid on her bed to rest for a few minutes before undergoing the fatigue of undressing; under these circumstances, a cup of beef-tea was brought to her; she took the cup unaided, and sat up on the bed to drink; but ere the vessel had reached her lips, she fell back in a mortal faint. I saw her lying dead on the bed an hour after she had been greatly enjoying her visit to the garden. From the late period of the malady at which death took place in this case, it is probable that the fatal syncope was dependent partly on paralysis of the heart from deficient innervation, and partly on atrophy of the muscular tissue of the organ. Under all the circumstances, it was much to be regretted that the visit to the garden had been permitted;

but had the child never left her bed, she might have died in exactly the same manner from failure of the action of the heart. Be that as it may, the case affords a good example of a common mode of death in diphtheria, and shows impressively the extreme danger of allowing diphtheritic patients to quit the horizontal position even for an instant unless fortified for the occasion by a stimulant. The degree of danger is of course proportionate to the degree of impaired cardiac power—but neither auscultation nor the pulse adequately reveal the debility of the heart, which seems to increase and diminish at intervals without obvious cause. A remarkable ebb and flow, at irregular intervals, in the power of the heart had been noticed for several days in the case now described.

The following case is an example of death in diphtheria, occurring suddenly from failure of the heart's action on the fifth day of the disease, and caused apparently by the direct action of the specific poison. The case is a good illustration of the topic under consideration, and confirms several practically important statements already made in this article.

On Friday morning, 31st December, 1875, I received a note from General P., an English resident in Paris, asking me to visit his daughter, a child of about nine years of age. On my arrival at the house, situated in a healthy locality in the immediate vicinity of the Arc de Triomphe, I was informed by the family—that is, by the father and the elder sister of the patient—that the indisposition was "sore-throat," associated with "biliousness." My first glance at the throat told a different tale. After examining the condition of the patient, I carefully investigated her health-history for the preceding week, writing down the material facts which I elicited; and which are here mentioned to corroborate previous statements in respect to the insidiousness of the invasion of diphtheria, and the kind of difficulty there is in determining the first day of an attack of this disease, even when the history of the stricken subject can be traced back into the routine of ordinary health.

On the evening of Friday, 24th December, the patient came home from a school in a neighbouring street where she was a resident pupil, that she might pass the following day—Christmas day—with her father and sister. She made no complaint of being unwell; but as she seemed to have "a cold in the head," her sister gave her a mild aperient in hot ginger-tea and sent her to bed. Next day (Saturday) being "all right" in the opinion of herself and others, she attended a long Christmas service in the rue d' Aguesseau English Church. On Sunday, 26th December, she again attended church. She made no complaint, was cheerful and seemed quite well. On Monday, 27th December, in the morning, she returned to her school apparently in perfect health. She there remained till the following evening, when she met by appointment her father and sister at a children's party, and returned home with them. Next morning—Wednesday, 29th December—she resumed her studies at the school. As that day went on, it was observed that she was ailing. In the afternoon, she complained of nausea and slight pain in swallowing. On the evening of this day, the cervical glands on both sides were observed to be swollen and tender to the touch. An alum gargle was employed on the recommendation of the lady of the school. On the morning of Thursday, 30th December, there was increased pain in swallowing, more tenderness of the cervical glands, and a greater amount of nausea. There was also some vomiting of bilious matters. Under these circumstances the patient was sent to her father's house early in the day, and not in the evening as had been intended. In any case, the child was to have gone home on that day for the usual holidays of the season. She made little complaint; but she looked unwell, and admitted that she had sore-throat and no appetite. She took an aperient and was put to bed. In the evening she had a warm foot-bath and drank some ginger-tea. She slept badly during the night.

On *Friday*, 31*st December*, about 10 a.m. (as has been already stated) I made my first visit. The child was reclining in apparent comfort on a couch, reading, when I entered. Her countenance was good, and her manner cheerful. The voice was not much affected, though appreciably husky and whispering after she had spoken to me for a few minutes. On both sides, the cervical and submaxillary glands were moderately turgid and tender. I made a very careful examination of the visible interior of the mouth and throat. The right tonsil was coated with a white pellicle presenting an appearance which an inexperienced person might have mistaken for ulceration. There was likewise a small patch of similar pellicle on the arch of the palate and on the back part of the pharynx. These three membranous patches were quite separate from each other. No exudation was visible on any other part of the mouth, throat, or on any other part of the body. No glands were turgid and tender except the cervical and submaxillary. Nothing abnormal could be detected in the lungs or heart by auscultation or percussion. The bowels were said to have been satisfactorily opened by the medicine. The urine was reported to be scanty. Some passed an hour before my visit, had a dark colour like the urine of jaundice: tested by heat and nitric acid it was found not to contain albumen. The tongue was slightly coated with a whitish slime. The pulse was 80, and remarkably feeble.

I announced that the disease was diphtheria—that the case was one of extreme danger—that there were two catastrophes to be dreaded within a day or two, namely, suffocation from obstruction of the air-passage, or sudden sinking from failure of the heart. The general symptoms, however, presented so little appreciable severity at this time that my statement was hardly credited. The father remarked that as he had had experience of diphtheria, having lost by that disease one child, and nearly lost another, he had some grounds for hoping that I might be mistaken as to the nature and gravity of the case. I stated the case was not without hope; but that the disease was diphtheria. I explained that as the aspect of diphtheria varies in different cases, it was easy to understand his not recognising the present in the former malady.

The treatment I prescribed was a little good soup with some brandy every two hours, and at the alternate hours a cup of milk, an aliment to which the child was very partial. I explained the primary importance of stimulation and alimentation. My instructions on this head, I may here remark, were diligently carried out from my first visit till within an hour of the child's death. I prescribed a syrup of sulphate of quinine and iron, directing a dose to be given every four hours. Each dose contained two grains of the sulphate of quinine and a sixth of a grain of sulphate of iron. I also directed a warm linseed poultice to be applied round the neck, and the mouth and throat to be washed from time to time with the spray of an aqueous solution of the glycerine of borax.

On my return in the evening I found the general appearance of the patient as good as in the morning, though the voice was a little more husky and whispering, and the greater part of the roof of the mouth was covered with a white pellicle. I ordered a continuance of the treatment prescribed in the morning; and requested to be sent for should a suffocative seizure, dyspnœa, or any other alarming symptom arise during the night.

On *Saturday*, *1st January*, 1876, about 9 a.m., I made my next visit. I was told that about four in the morning the breathing had been very much disturbed for a short time, but that as this state had soon passed away in a tranquil sleep I had not been sent for. The urine voided since my visit on the previous evening was scanty and turbid. It did not contain albumen. A portion which I had set apart for examination with a view to determine its exact constitution was thrown away by mistake. The appearance of the throat was very disquieting. The pellicle in one continuous mass covered the right tonsil, the back part of the pharynx, and the roof of the mouth. On the left tonsil there was no membranous coat, but only a grey speck as large as a split-pea: this speck had more the appearance of coloration than of exudation, though it was, no doubt, the latter in its very earliest stage. Tbe breathing was not difficult. In reply to questions, the patient said that for a few minutes at long intervals she had had a feeling "like suffocation," and that her greatest discomfort was a constant sensation of "pricking in the middle of her throat, and of there being something there which she would like to take out." I said: "Touch the place where you have this discomfort." She immediately placed her finger on the larynx. The treatment was continued.

On *Sunday 2nd January*, between 9 and 10 a.m., I found a great aggravation of all the symptoms. The night had been restless, and at intervals the breathing had been disturbed by suffocative paroxysms. When I arrived, the breathing was declared to be then worse than it had ever been, and after my arrival the dyspnœa rapidly became so great as to be almost apnœa. After five or ten minutes of gentle muttering delirium, without any preceding attack of suffocation, struggling, or convulsions, she ceased to speak, rolled the head several times from side to side, and presented a turgidity and purpling of the face and neck. Within a few minutes, in fact when under my eye, she passed very calmly into a state of advanced asphyxia. The extreme gravity of this condition as now described was not of long duration. The severity of the asphyxial phenomena rapidly—I may almost say suddenly—diminished after a spontaneous fit of violent vomiting and retching. After vomiting without much effort a large quantity of bile, there followed a good deal of straining and retching during which the ejecta were scanty, not consisting of more than three or four ounces of a thin slimy matter in which floated tough membranous shreds, some of which probably came from the air passages, but the greater portion of which had been detached from the tonsils, back part of the pharynx, and the roof of the mouth, as was evident by patches of mucous membrane in these situations being denuded of their previous pellicular coating.

Before the patient had this unlooked-for respite, I had written a note to my friend Dr. Jules Simon, requesting him to come with the least possible delay, to give the benefit of his skill to the patient, and to divide with me the responsibility of a case of laryngo-tracheal diphtheria, in which tracheotomy could not be long delayed.

It was during the father's absence to deliver my note that the respite occurred which has now been described. Dr. Jules Simon was not at home and did not join me in consultation till noon, till which time I never left the child. When waiting for Dr. Jules Simon, I had the satisfaction of consulting in the case with my friend Dr. M'Carthy, who agreed with me that while the patient might at any moment require tracheotomy, the operation had for the time being ceased to be an immediate necessity. It was agreed that I should remain with the patient, ready to act in accordance with any emergency that might arise, and to administer an emetic if the child made a rally under the influence of beef-tea and brandy—which for half an hour I gave with imperfect success, everything received into the mouth occasioning spasmodic dysphagia. I was at last enabled to give the child twenty grains of the powder of ipecacuan. It induced some vomiting and retching with the result of more membranous shreds being ejected. Twenty minutes or half an hour of easier breathing than the child had had for many hours ensued: but this temporary amelioration had nearly ceased when Dr. Jules Simon joined me at noon.

We agreed entirely as to the nature of the case, the treatment, and the probable issue. First of all, we decided on a continuance of the treatment—alimentary and medicinal—a continuance of the beef-tea and brandy, of the ferruginous syrup of quinine, and of the local application to the interior of the throat and mouth. We then intimated that we believed life to be waning rapidly, but that it was nevertheless our duty—founded upon our own experience and the experience of others in similar cases—to prolong life by the administration of aliments and stimulants, and, if need be, by tracheotomy, in the hope that during the prolongation of life so obtained, a spontaneous favorable change might occur, affording a fresh opportunity for the combined curative efforts of nature and art. We stated that our examination of the patient left us in doubt as to whether the diphtheritic pellicle had descended into the trachea and bronchial tubes, but that if it had, our hope of permanent advantage from tracheotomy was very small. We nevertheless emphatically declared that the operation was demanded, as it had often saved cases apparently as discouraging. The recommendation was accepted by the father; and half past five was fixed for the operation, unless before that time an emergency arose which rendered delay dangerous, or unless an unlooked-for change for the better in the symptoms made it possible to dispense with the operation.

When we met at half past five, we found that matters were steadily and rapidly becoming worse. There had been only two or three suffocative attacks since noon, and they were of very short duration; but the asphyxia was nearly as urgent as at my morning visit. We said that there was no time to lose. The child was speechless, livid, and asphyxiated, when Dr. Jules Simon operated at six o'clock.

The operation, easily and rapidly performed, was immediately followed by a cessation of the asphyxia. The patient a minute afterwards smiled, and with eager satisfaction drank a cup of brandied beef-tea which was offered to her. There was very little loss of blood. Not the smallest scrap of false membrane presented itself at the operation-wound, nor in the canula at the time of the operation or afterwards. The opening made in the trachea was, we therefore concluded, below the lowest part of the diphtheritically coated mucous membrane. I left the patient at eight o'clock: she was then warm, comfortable, breathing nicely, and smiling answers which she could not speak. A slate having been procured, I asked her to write a reply to the question—*Do you feel better since the operation?* She wrote "*Much*:"—and then in reply to my second question—*Is there anything you wish to ask me before I leave you for a few hours?* she wrote—"*May I have some milk?*"

The patient's sister, in my presence, several times removed the inner canula before I left, replacing and locking it calmly and quickly. She was told at once to remove and wash the inner canula should any difficulty of breathing arise, and in any case to take it out once every hour till my return. This she did. At first the inner canula was found to contain black loosely congealed blood. There might altogether be about two or three teaspoonfuls of this black clotted blood removed from the canula and from the sides of the operation-wound: in colour and consistence it resembled black currant jelly.

When I returned at midnight, the father greeted me with the assurance that his child had made "solid improvement"—had regularly every hour taken her appointed dose of brandied beef tea—had breathed well—and had slept calmly during the greater part of the intervals. I found the state of matters not quite so favorable; but could not perceive any decidedly bad symptoms. The respirations were, however, more shallow and more rapid; the pulse, which was 88 when I left her at eight o'clock, was now 100, and feebler. Her countenance was pale, cheerful, and smiling. Using the slate, she nimbly answered and asked questions. I said—"*Do you feel much better now than before the operation?*" She wrote (as at 8 o'clock) "*Much.*" I said—"*Do you* *feel as well or better than when I left you at* 8 *o'clock?*" She replied—"*Just the same.*" One of the five or six questions which she asked me was—"*When shall I be able to speak?*" When I said "*Not for a week*" she smiled in a way which evidently meant she was glad that the time of speechlessness was to be so brief. I left the father and sister more satisfied than I was with the patient's state, and expressed myself to that effect—adding, however, that matters were in a far more hopeful state than when I made my morning visit.

I confess I received a great surprise as well as a painful shock on reaching the house at half past nine next morning to find that the patient had died suddenly about ten minutes before my arrival. She had written on the slate and taken nourishment an hour before death. Dr. Jules Simon—who had on the previous evening appointed to meet me at half-past nine—arrived a few minutes after me. We together examined the canula and also the trachea so far as this could be done by dilating the operation-wound, but in neither was there any obstruction from false membrane, blood, or mucosity.

Topics already considered in this article are well illustrated by the case now described—in particular the insidious manner in which the disease takes possession of its victim, and the virulence of the poisoning coexisting with a non-albuminous state of the urine.

THE PATHOLOGY AND MORBID ANATOMY of Diphtheria have been already indirectly and incidentally considered in the preceding pages. Without attempting to treat these subjects in detail, a short statement of their essential features may now be added.

The characteristic necroscopic appearances found in the bodies of persons who succumb to diphtheria during its first manifestations—say within a week from the beginning of the attack—are layers of *false membrane* in certain situations, and *sanguineous congestion* everywhere. When life is prolonged beyond that period, particularly if prolonged for weeks or months, there is no trace of false membrane in the favourite localities referred to; and instead of sanguineous engorgement, we find an anæmic condition of all the organs and tissues. We then likewise meet with muscular atrophy, and various lesions originating in defective nutrition and the long continuance of impaired innervation.

The false membrane is the characteristic morbid phenomenon of diphtheria; and yet patients die of diphtheria in whom no trace of false membrane can be found at the autopsy—they have so rapidly succumbed to the virulent influence of the poison that there was not sufficient time for the production of the pellicle.

The strata of diphtheritic concrete pellicle frequently present a grey slough-like appearance, often mistaken for sloughing and ulceration of the mucous membrane. It has been so called by authors in their accounts of the morbid changes visible both in the dead and living body, a circumstance which explains the discrepancy—more apparent than real—among physicians as to diphtheritic sore-throat being sometimes or never sloughing or ulcerative in its character.

The situation of the false membrane—as has already been stated—may be any where on the mucous or cutaneous surface. An idea of the relative frequency of its more common localities is afforded by a statement given by Jules Simon, in his article on "Croup," published in 1869.[1]

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[1] SIMON (Jules):—'Nouveau Dictionnaire de Médecine et de Chirurgie Pratiques,' tome x. Paris, 1869.

From an analysis of 171 necropsies recorded by Bretonneau and Hussenot, he finds that false membrane existed in the air-passages of 150 subjects, and was absent in 21 subjects. In 78 of the 150 cases, the false membrane did not descend below the trachea, and in 42 cases only did it go down into the bronchial tubes. This analysis probably gives a fair general idea of the relative frequency with which localities are invaded by the false membrane; but it must always be remembered that in this respect every epidemic has its own peculiarity. The great statistical fact in this matter of locality is that diphtheria prefers the mucous membrane of the air-passages to all other mucous membranes; and that there are no mucous membranes on which it is so rare to find it as on those of the œsophagus and stomach.

Great sanguineous congestion of all the organs and of all the mucous surfaces of the body is a constant *post-mortem* appearance in the bodies of persons who have died of diphtheria before the end of the exudation stage of the disease. Patients who die after surviving that stage, during what may be called abortive convalescence, present an opposite condition after death—the organs are pale—everywhere there is a deficiency of red blood. In such subjects, together with a spanæmic condition, there is enlargement of the spleen in most cases.

The sanguineous congestion now being spoken of is not the congestion dependent on death having taken place by asphyxia, for it is found in cases in which life has ceased in another mode. In examining the bodies of persons who died of the "highly congestive form" of the Edinburgh epidemic of Relapsing Fever of 1843-44, I found a general state of congestion similar to that which I have now under consideration;[1] and it has been described by the historians of "yellow fever" and of other fevers of different names. *A tarry inspissated state of the blood* has been found to exist during life in some of these fevers; and probably in diphtheria, as in them, it or a somewhat similar condition is present during life as one of the earliest manifestations of the poison. This state of the blood is partly due to extreme nervous congestion; but there is anterior blood-lesion which either is the starting point—or very near to the starting point—of the general congestion. This statement seems a legitimate induction from clinical facts to some of which reference has already been made in these volumes. It will here be sufficient to notice three groups of these facts.

First:—When examining the blood of some of my Edinburgh fever patients in 1843, Professor Allen Thomson and I found an abnormal appearance of the blood-globules, and a great number of the corpuscles which at that period were called "pus-globules." "A gentleman," to quote what I wrote in 1843, "who was present upon this occasion was observed to have his blood exactly in the same state as the fever patients, and within two days he was seized with fever and went through two mild attacks—or to use conventional phraseology—*the fever and the relapse.* The blood of some other healthy persons was also examined at the same time: it exhibited nothing unnatural, and none of these latter individuals have taken the fever although a month has now elapsed since the observation was made."[2]

Second:—Dr. Mitchell mentions that in the Yellow Fever of Virginia, "blood drawn from a vein was invariably dissolved : the same state of the blood was always observed in many persons who had been exposed to the miasmata who discovered no other symptoms of the disease." On the fourth day after the attack, Dr. Mitchell uniformly took a few ounces of blood from the temporal artery, when he constantly found it dark and venous-looking.[1]

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[1] See vol. i, p. 42 *et seq.*

[2] See vol. i, p. 268.

Third :—The black tarry colour and consistence of the blood which appears in the operation of tracheotomy in diphtheria is familiar to those who are in the habit of seeing such cases. It may be explained to a certain extent by the asphyxiated state of the patient before the operation, but for two reasons I believe that the tarry like appearance of the blood seen in tracheotomy for diphtheria is not always and altogether the result of asphyxia : in the *first place*, in a child two days after tracheotomy, when there had been no difficulty of breathing since the operation, I witnessed a nasal hæmorrhage, in which the bleeding resembled a dropping of inspissated tar from the nostrils ; and in the *second place*, because blisters applied to persons living within the area of an epidemic of diphtheria become covered with diphtheritic pellicle, even in persons who neither then nor afterwards have any of the manifestations of diphtheria.[2]

The facts adduced in the preceding pages are sufficient to show that DIPHTHERIA *is a disease ; and that* CROUP *is not a disease*, but a symptom of laryngismus stridulus, laryngitis stridulosa, laryngo-tracheal diphtheria, and some other affections.[3] This subject is more fully elucidated in its literary aspects in a separate article. The present *clinical study* may be appropriately brought to a conclusion by a succinct definition of diphtheria, sufficiently comprehensive to embrace all forms and varieties of the disease.

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[1] Vol. i, p. 170.

[2] Vol. ii, p. 290.

[3] Of course "croup," using the term in its current and absurd French acceptation, is a disease—is laryngeal or laryngo-tracheal diphtheria.

DIPHTHERIA is a specific, contagious, asthenic, general disease characterized by the exudation in certain situations —particularly on the mucous surface of the soft palate, uvula, tonsils, pharynx, larynx, and trachea—of a peculiar cacoplastic lymph which together with epithelial cells generally forms a thick tough and stratified pellicle or false membrane.

In certifying the cause of death in the case of Miss P. I said that she died of "croup," using the common French term for "laryngeal diphtheria."

IV.

DIPHTHERIA IS A DISEASE: CROUP IS A SYMPTOM

OF

LARYNGISMUS STRIDULUS,

LARYNGITIS STRIDULOSA,

LARYNGO-TRACHEAL DIPHTHERIA,

AND

SOME OTHER AFFECTIONS.

CROUP AND DIPHTHERIA.

In 1826, Bretonneau, the renowned physician of Tours, by the publication of his work entitled:—*Recherches sur l'Inflammation Spéciale du Tissu Muqueux, en particulier sur la Diphthérite*"—created the name, and first pointed out the true pathology of the disease of which cases described in the preceding article are typical examples. It must, however, be remembered that although that work contains a grand unveiling of the truth, and constitutes the foundation, and much more than the foundation, of one of the most brilliant and important clinical inquiries which adorn the history of medicine, it is not so complete an account of DIPHTHERIA as other accounts written by subsequent authors who, using his canvas, have filled up and corrected some of his outlines. Bretonneau himself by clinical study considerably modified his original view of the pathology of the disease. Both in his earlier and later writings he regards as specific the exudation which becomes a tough, leathery, coherent pseudo-membrane; but in his latest memoir published in 1855 he substituted the term *diphthérie* for *diphthérite*, because he had discovered that the disease is not of an inflammatory character.

From the year 1826, when Bretonneau published his first memoir, until the appearance in 1859 of Dr. R. H. Semple's volume for the New Sydenham Society, the word *Diphtheria* scarcely ever occurs in British medical literature, and when it is employed, it is only in the writings of those who had personally known Bretonneau, or who had some considerable acquaintance with French medical books. Among the very few British medical authors who had used the word *Diphtheria* or described the disease were the late Dr. John Conolly, whose brother Dr. William Conolly, when practising at Tours, had attended several cases with Bretonneau; the late Dr. Copland, who had visited Bretonneau at Tours, and who alludes to the disease in his article "Croup" in his Cyclopædia; and Dr. John Abercrombie, of Edinburgh, who mentions the malady incidentally and parenthetically in his work on "Diseases of the Stomach and Intestines." In the year 1859 the New Sydenham Society published Dr. R. H. Semple's translation of a series of memoirs from the French. This volume included the whole of Bretonneau's contributions to the history of diphtheria, and also those of some of his pupils and successors, among the most distinguished of whom was Trousseau, who has most ably and successfully developed the ideas originating with his instructor. This volume was the first contribution to the general history of diphtheria which appeared in Great Britain.

The writings of Bretonneau are exceedingly valuable as containing the record of a great number of well-collected facts, a great mass of important historical research, a large amount of correct pathological reasoning, and some most useful therapeutical lessons. But it must not be supposed that his opinions are all equally trustworthy; for in the early period of all discoveries it is inevitable that much loose generalization will be advanced and some doctrines proposed which subsequent experience will tend to disprove, and from such demerits the memoirs of Bretonneau are by no means exempt. His writings must therefore be regarded as pioneers in a path which subsequent investigators have carefully explored, and from which some superfluities and obstructions have been removed. It is, however, rendered quite evident from the writings of Bretonneau, and those of his disciples collected together in the volume of the New Sydenham Society, that the disease now known as diphtheria has existed, although under different names, at many periods of the history of medicine, sometimes appearing as a destructive and widely spread epidemic, and sometimes, and perhaps constantly, occurring in a sporadic form. Bretonneau succeeded completely in proving that the epidemics he witnessed at Tours were no other, in their pathological nature, than those which had desolated many other parts of Europe in former years, as Italy and Spain in the seventeenth century, and Italy and Scotland in the eighteenth, at which latter epoch the disease was also described as occurring in New York, where it carried off the celebrated Washington. These and many other epidemics described respectively by Baillou, of Paris; Herrera, of Spain; Nola, Sgambati, and Carnevale, of Italy; Cortesius, of Naples; Home, of Scotland; Samuel Bard, of New York; Starr, of Cornwall, and other nosographers, were identical with the epidemic of Tours, first noticed and described by Bretonneau in 1826, and with subsequent epidemics occurring in the same place and also described by him, and with other outbreaks afterwards observed in various parts of France. It is well known that in 1857 and several subsequent years the disease described by B neau occurred as an alarming and widely spread epidem England.

On its first arrival in Great Britain its title to any sp designation was generally doubted, and it was regarde only an exaggerated form of sore-throat or a peculiar abnormal development of scarlatina; but, by a sudden not uncommon change of professional opinion, no so had the features of the disease been at last fully e lished, than almost *every* form of throat-disease was nified by the title of diphtheria; and some medical wr in England endeavoured to show that the name was or generic term including all kinds of disease affecting throat, such as scarlet fever, thrush, laryngitis, qu and many others. That the real nature of diphtheria often misunderstood may be inferred from a perusal of medical periodicals of the time, in which we find, for stance, a writer proclaiming that in a wide-spread epid of diphtheria he had employed a remedy so valuable he had not lost a single patient (!); and another, deta a visitation of what he terms *Diphtheritic Scarlatina.* first writer must have overlooked the circumstance diphtheria is essentially a most dangerous and fatal mal and the second obviously confused together two dis which are as distinct from one another as measles smallpox.

Another and certainly the most troublesome elemen confusion in the literature of this subject is the bewilde jumble as to the nature of diphtheria, which was some y ago almost universal in lectures and text-books, and is now beginning to disappear under the enlightening i ence of a few British writers, among whom deserve t specially mentioned Dr. George Johnson and Dr. R. H. Semple. These writers have done good service to the science of medicine by the clearness with which they have pointed out the nature of the misunderstanding so long prevalent among clinicians and compilers as to the relations to one another of "diphtheria" and the so-called "croup." The "croup" of Francis Home, the "true croup" of the latest French writers, and the "tracheal diphtheria" of Bretonneau are synonymous terms; but nevertheless it does not follow that "croup" and "diphtheria" are the same, inasmuch as many English authors have confounded different diseases under the one designation of "croup."

Diphtheria is a malady *sui generis*—a specific, asthenic, general disease. It is contagious, and sometimes occurs as an epidemic, but is always present in some districts of the country and in some towns—in Paris for example—in a sporadic form.

The leading characteristic of diphtheria is an exudation from mucous surfaces, wounds, and cutaneous abrasions, which becomes a tough, leathery, coherent, false membrane, and may be met with on the mucous membrane of the pharynx, larynx, trachea, bronchial tubes, nares, eyelids, and vagina, as well as around wounds and on cutaneous abrasions. We often see this false membrane form on the edges of the tracheotomist's incision in cases of pharyngo-laryngo-tracheal diphtheria, as was observed on the 27th October in the case of E. G. On that day—the second after the operation—the report states that "there had been some oozing of blood from the *operation-wound, the edges of which were coated with a diphtheritic pellicle.*" It sometimes happens that patients throw off casts of tough, coherent membrane from the larynx and upper part of the trachea, and when we resort to tracheotomy we can sometimes drag out by the incision large pieces of false membrane. This occurred in the case of E. G.

The false membrane is not a product of the process commonly called *inflammation*—it is not ordinary lymph—it is a stroma made up of mucus and epithelial cells arranged in layers of cacoplastic exudation, which are placed one above the other, and are separable from one another like the leaves of a book. Some fibrillation is observable in the texture of the layers, but the layers do not consist of fibrin or of albumen.

Membranous sore-throat and diphtheritic sore-throat are used by some as synonymous terms; and there are some who use *membranous* and *diphtheritic* "croup" as synonymous terms and as appropriate names for the affection which presented itself in the case of my patient E. G. I cannot quite concur in this opinion. In the first place, the word "croup" ought to be expunged from medical literature, as from its many meanings and misleading traditions it has become a source of chaotic controversy and confusion in our current medical literature. If the word be retained it ought only to be as a synonym for stridulous breathing and not as the name of a disease. The worse than uselessness of continuing to use "croup" as the name of a disease is obvious when we find it applied in so many different senses.

A retrospect of the history of the term *croup*, and a statement of the various and even opposite meanings now attached to the word, show the desirability of allowing it to fall into desuetude as the name of a disease, and of only employing it—if at all—as signifying stridulous breathing without relation to the cause of that symptom.

"CROUP" is a word which has a more curious history in the literature of clinical medicine than any other word with which I am acquainted. Its début in the arena of scientific medicine is thus described by Dr. Charles Wilson in his learned and valuable "Observations on Croup," which appeared in the *Edinburgh Monthly Medical Journal* in 1855 and 1856.

"Its first appearance in our medical literature, in as far as I know, is in a letter addressed by Dr. Patrick Blair to Dr. Mead, dated 'Cowpar of Angus, July 6th, 1713,' in which the writer, discussing more especially *pertussis*, speaks of 'a certain distemper with us, called the *croops*, with this variety, that whereas the chink-cough increases gradually, is of a long continuance, seizes in paroxysms, and the patient is well in the interval, this convulsion of the larynx, as it begins, so it continues so violently that unless the child be relieved in a few hours, 'tis carried off within twenty-four or at most forty-eight hours. When they are seized, they have a terrible snorting at the nose and squeaking in the throat, without the least minute of free breathing, and that all of a sudden, when perhaps the child was but a little time before healthful and well.' [*Observations in the Practice of Physic, &c.*, p. 92, *London:* 1718.] The orthography of Blair thus marking the usual pronunciation, we find the word at later intervals uniformly written as *croup*. For the origin of this term, we justly look to a root which is common to the whole of the Teutonic tongues, and which, appears for example, in the Icelandic *Hròp* (*clamatio*); in the Anglo-Saxon *Hreopan* (*clamare*), and in *Crâvan*, præt. *creòv* (*cantare instar galli*); in the Gothic Hropjan, Hropi, (*clamare*, *clamor*); and in the old German Hrôf (*clamor*); the letters *h* and *c* and *v*, *f*, and *p*, being readily interchangeable in these kindred languages. But it is to the Frisian element of our language, the importance of which is becoming daily more recognised by philologists, and to where we find it now most directly represented, that we may refer for the term the closest allied to our primary signification of *croup*; the modern Dutch word *Geroop* (*cry*) being pronounced so as to be as intimately analogous in sound as it is likewise in signification. The North of England and Scottish word *Roop* (hoarseness) will suggest itself as referable to the same origin. We are thus carried back to an era prior to that in which the Anglo-Saxon, Frisian, and Dane parted from their common stock; and long prior to the successive periods at which they settled in this country. A term so ancient, so expressive in itself, and so thoroughly and specially an appropriation of our medical literature, ought not to be endangered by being allowed to swerve into meanings remotely derivative."[1]

It is easy to see from the scope of his work that Dr. Charles Wilson takes a symptom—stridulous breathing—considers it as a disease, and calls it *croup*—a word for which he entertains a strongly expressed veneration and affection with which as a Scotchman and an Edinburgh student of the Alisonian era I sympathise. As a practical physician, however, long since converted by Bretonneau and Trousseau, to views different from those which I was originally taught, I entirely differ from Dr. Charles Wilson as to employing "croup" as the name of a disease.

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[1] WILSON (Charles) :—Observations on Croup in *Edinburgh Monthly Medical Journal* for February, 1856, p. 675 The paper quoted in the text is one of a series constituting a work of sterling value, containing a great amount of interesting research and good clinical observation. It has, however, like many less important writings on the same subject, a fundamental blemish which stands forth conspicuously in the light of modern pathological research:—it confounds different diseases under one name.

Unfortunately, the word has already not only drifted very far from its original signification—which was simply *stridulous breathing*—but has acquired entirely new meanings in passing into the literature of foreign countries. A very cursory review or even a mere glance at British, French, and German medical literature will at once establish the accuracy of this statement, and explain the strange pathological jumble in which the whole question was long involved, and from which it is only now emerging.

Most French physicians of the present day, adopting the views as well as the nomenclature of Bretonneau and Trousseau, apply the names *croup* and *vraie croup* to the membranous sore-throat which is the local manifestation of the general disease called diphtheria. They apply to laryngo-tracheal diphtheria the terms *croup* and *vrai croup* (true croup) to distinguish it from the *faux croup* (false croup), the non-membranous affection in which spasm with stridulous breathing is the predominating feature. Many of them in this way include together the non-inflammatory spasmodic affection or laryngismus stridulus and laryngitis, which latter is nearly always a stridulous affection in infants. It is the "inflammatory croup" of various English authors, and was represented by Francis Home as a stage of membranous croup (diphtheria). In his famous little monograph, he describes only eight cases, and of these five are tracheal diphtheria and three laryngitis. As no false membrane was seen in these three cases, he—like many of his successors—jumped to the conclusion that the false membrane was absorbed, or its formation prevented by the treatment. For a long period, his successors, British and foreign, continued

to make the same mistake—and indeed
published the results of his clinical study
adverted to was universally accepted as the
mixed up tracheal diphtheria with laryngiti
the recoveries from the latter to the energy
by bleeding and purging, and he ascribes
tracheal diphtheria to the omission or impe
that treatment. In 1810 the Emperor N
prize for the best treatise on croup. Many e
to compete for the reward. The successfu
Albers of Bremen. It seems very evident th
prize because he roundly stated that he cure
and that the practitioners who had not t
were unsuccessful only because they did
and as largely as he did. All the Napol
petitors confuse together laryngismus stridu
flammatory laryngitis, and laryngo-tracheal

Most British authors, when they write
really mean laryngitis and laryngo-trachei
"croup" be so interpreted, it is of course
different from diphtheria. So explained—
terpreting *simple inflammation* by the term
with much that is contained in the followi
by Professor Spence in his remarkable and in
in Surgery, delivered before the British Me
at Edinburgh, in August, 1875.

"It has been with no small amazement,
Spence, "I have read some of the views re
that croup and diphtheritic croup are i
hardly conceive two diseases more differ
consider them in their causation, sympt
In one feature, doubtless, there is similarit

in diphtheria the air-passages become affected, the presence of the membrane exuded necessarily gives rise to the same physical symptoms as to sound of voice, breathing, and asphyxiating paroxysms, as the false membrane in simple croup does. But in diphtheria, the exudations in the larynx or elsewhere are the local expression of a special blood-disease, which may and often does destroy life without affecting the air-passages at all, whereas in simple croup the false membrane is the result of a local inflammation. The causes or circumstances in which the two diseases originate are, according to my experience, very different. Ordinary croup almost invariably arises from exposure to cold, or occasionally from some source of local irritation, leading directly to inflammation of the mouth, as dentition."[1]

Agreeing generally in these remarks, I doubt whether a false membrane is ever formed on the mucous surface of the larynx and trachea in "simple croup," or *in any affection which is not diphtheria.* I have never seen an inflammatory false membrane in these situations, though I have long been diligently inquiring after such cases. I may be wrong; but till by an actual clinical demonstration the contrary is established, I shall continue to believe with Dr. George Johnson and Dr. R. H. Semple, that false membrane is never met with as the result of a *simple* local inflammation.

Some of the best French writers comprise in one name both the nervous and the inflammatory affection, a proceeding which Dr. R. H. Semple says is a cause of confusion. To a certain extent, it does occasion confusion, for laryngismus stridulus and laryngitis stridulosa are essentially distinct pathological conditions. On the other hand, the French writers censured for inaccuracy by Dr. R. H. Semple are not altogether wrong, because a case which is pure laryngismus at its commencement often becomes catarrhal, and inflammation of the larynx is a common cause of spasm of the glottis: in fact, spasm of the glottis occasioned by laryngeal inflammation is the affection sometimes called "laryngitis stridulosa," and sometimes "inflammatory croup." Nevertheless, the criticism of Dr. R. H. Semple is well founded. Its bearing on practice is very important. There are many cases of laryngismus stridulus presenting phenomena which are clearly reflex—truly nervous—the pneumogastric nerve being implicated, in which the symptoms cease as if by magic, when the source of irritation is removed. For instance, we often see symptoms of impending suffocation disappear suddenly on lancing the gums. This is not laryngitis; and it is a condition in which depletion is out of the question. Moderate cases of laryngitis are successfully treated by ipecacuan, purgatives, and poultices: severer cases demand the severer treatment by leeches and tartar emetic.

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[1] SPENCE (James):—Address in Surgery delivered at the Forty-third Annual Meeting of the British Medical Association held in Edinburgh, August, 1875. [Reprinted from the British Medical Journal for August 14th, 1875.] Vide p. 21.

"Rilliet and Barthez" says Dr. R. H. Semple, "in their *Traité des Maladies des Enfants*, second edition, published in 1853, draw a clear distinction between 'croup,' or as they term it *laryngite pseudo-membraneuse*, and 'laryngitis stridulosa,' which they term *laryngite spasmodique*. I do not adopt the names given to these affections by Rilliet and Barthez, because the first is not proved to be an inflammation, and the second is so distinctly inflammatory that the epithet *spasmodique* might lead to misconception as to its true nature. But the two affections, which Rilliet and Barthez call respectively *laryngite pseudo-membraneuse* and *laryngite spasmodique*, correspond exactly to the two described by other authors as 'tracheal diphtheria' or 'croup,' and 'laryngitis stridulosa.' Strangely enough, Rilliet and Barthez state that in France the two affections are often confounded together, whereas in England they are carefully distinguished; a statement exactly contrary to the fact, for in France the laryngeal affection attended by the pseudo-membranous exudation is always referred to diphtheria, while in England the tracheal diphtheria and the laryngitis stridulosa are generally confounded together. Without entering at length into the details of the two affections given by Rilliet and Barthez, it may be stated that while the production of the false membrane is the essential character of the one disease, it is never found in the other."[1]

To conclude:—There can be no objection to the use of the word "croup" in its original sense as a term for stridulous breathing—a symptom common to laryngismus stridulus, laryngitis stridulosa, and laryngo-tracheal diphtheria; but there is a great objection to continue to speak of "croup" as a *disease*, the name being now given to affections essentially distinct in their pathology.

In support and illustration of the views here advanced in relation to the use of the terms "Croup" and "Diphtheria,"

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[1] SEMPLE (Robert H.):—On Diphtheria and the Diseases Allied to it or which may be mistaken for it. Transactions, 1870, of the St. Andrew's Medical Graduates' Association. London, 1871. See p. 215.

I refer to a paper—"On Certain Points relating to the Etiology, Pathology, and Treatment of Diphtheria," by Dr. G. Johnson, in the *Lancet*, Jan. 2nd and 16th, 1875; to "A Lecture on the Relation between Croup and Diphtheria," by the same author, *British Medical Journal*, Sept. 18th, 1875; to a pamphlet "On Croup and Diphtheria," by Dr. R. H. Semple, London, 1872; and to a review on "Croup and Diphtheria" in the *British and Foreign Medico-Chirurgical Review* for January, 1876.

Sir Thomas Watson and Sir William Jenner have also recently adopted the modern views, as may be seen by reference to the 'Lectures on the Principles and Practice of Physic,' article "Diphtheria," fifth edition, 1871, by the former; and to a "Clinical Lecture on Croup, and Diseases that resemble it," *Lancet*, Jan. 2nd and 16th, 1875, by the latter.

V.

PARALYTIC AFFECTIONS

OF

DIPHTHERIA:

THEIR

NATURAL COURSE, PATHOLOGY, AND TREATMENT.

[Paper read before the Section of Medicine of the British Medical Association at Norwich, on Wednesday, 12th August, 1874; published (with additions) in the *British Medical Journal* for 17th October, and 12th December, 1874.]

PARALYTIC AFFECTIONS OF DIPHTHERIA.

THE simplest means of opening up the clinical study of Paralytic Affections of Diphtheria is to give a detailed account of a minutely observed case in which recovery took place after a severe and typical course had been fully run.

In specific fevers, in pneumonia, rheumatism, cholera, and in many other acute diseases, the best physicians of the present day do not arrogate the part of curers: they do not pretend that the medicines they employ are remedies for these diseases. Relying on their knowledge of the natural history of the malady they have to manage, and making themselves acquainted, to the utmost possible extent, with each patient's condition in respect of vital power, duration of the malady, previous history, state of organs, and constitutional peculiarities, they are *ever ready*, and *never hasty*, to institute an active interference, whether it be to aid Nature's curative efforts, to correct supervening morbid manifestations, or to obviate a tendency to death. The great importance of applying similar principles to the treatment of diphtheritic paralysis is well illustrated by the case to be now described.

On *February 21st*, 1874, S. M., aged 49, a married Englishman, living with his wife and children at 6, Rue Marie Antoinette, Belleville, Paris, applied to me in the consulting-room of the Hertford British Hospital, for admission as a resident patient; and as such was admitted on the same day. Leaning on his wife, he was enabled to shuffle from the cab to the room in which I received him—a distance of about fifty yards. Some months previously, I had casually met him in one of the thoroughfares of Paris: he then seemed fairly well, and gave me a pretty good account of the health of himself and his family. He looked stronger and better than he usually appeared. This patient had been known to me for some years as an industrious man, struggling, with the assistance of his wife, to surmount the evils incident to irregular employment and imperfect alimentation. I made the acquaintance of this poor man and his family during the first—the German—siege of Paris, when, in common with about fifteen hundred other British subjects, they were saved from starvation through the merciful ministry of the British Charitable Fund. In January, 1871—the cruel month which preceded the capitulation—when icy winds were fraught with death, fuel a priceless luxury, rations at their lowest ebb, and "bread" had become a nauseous mockery of food, S. M. was exceedingly emaciated, and tottered like a feeble old man. He was, nevertheless, obliged to minister, as best he could, to his wife, prostrated by debility, and to his children, suffering from severe whooping-cough, complicated with broncho-pneumonia. It was not remarkable, therefore, that in answer to my first question on the 21st February, 1874:—*From what are you suffering?*—he should at once have succinctly replied—*From a relapse of the siege disease.*

By careful questioning, a circumstantial history was obtained; but that history would not accurately present the whole case if unaccompanied by the introductory statement now made.

On *January 1st*, 1874—that is, fifty days before he applied to me at the Hertford British Hospital—S. M. had begun to feel unwell, and three days later, he consulted a French physician residing in his immediate neighbourhood. He was then very weak, and suffered exceedingly from a painful swollen hand. His medical adviser prescribed cinchona wine internally; and for the hand, externally, a mercurial ointment. This ointment was used only for forty-eight hours, during which time the pain and swelling of the hand increased. He then, acting on his own ideas, discontinued the ointment, and applied a large poultice for twenty-four hours, at the end of which time he found that an abscess was pointing on the back of the hand. S. M. then applied to the poor-law doctor of the *arrondissement*, who opened the abscess, afterwards prescribed poultices, and then a lead ointment, which was applied regularly twice a day for nearly a month. Under the free use of this ointment the hand healed up and returned pretty much to its normal appearance.

About the 20*th January*, when using the lead ointment, he became affected with a malady in the throat, similar to that from which two of his children were then convalescent. This malady, from S. M.'s description, was evidently diphtheria, and was so called by the practitioner who attended him and his children. Neither of the children had any form of paralysis during, or subsequent to, their throat-affections.

When S. M. had been put to bed on his admission, I examined him minutely, dictating, at the time, a complete report of that examination which I now quote, as corrected at the bedside on the following day.

His lips are parched. His gums are rather spongy: they present no blue line. The tongue is thickly coated with a dirty, yellowish, sticky slime. On the mucous lining of the mouth, tonsils, and pharynx, there are aphthous patches, some of which are of considerable size. On the back of the pharynx, there is a round deep ulcer, nearly as large as a half-franc piece, and covered with a mucous secretion.

There is a moderate amount of distension and general tenderness of the abdomen. Besides the pain elicited by palpation and percussion, the patient complains of a distressing feeling of abdominal constriction, associated, at intervals, with a strong desire, but ineffectual attempts to evacuate the bowels. He states that, during the ten days preceding admission, he has had only two stools, hard and scanty, the result of large doses of castor-oil, senna, and other purgatives, supplemented by copious enemata of salt and water.

At this stage of the examination, the patient became so weary and faint, that I suspended my investigation of the physical thoracic signs which I had just begun; and at the same time, I ordered some brandy-and-water to be administered as a restorative. When this mixture was held to his lips, he managed to get some within his mouth, but was unable to swallow any of it. Each attempt at deglutition induced spasmodic cough, the liquid which had been received into the mouth being at the same time ejected through the nose. Strong cold beef-tea of the consistence of jelly was then tried, and with rather better success. This description of food, however, likewise excited a choky cough; and, with each effort at deglutition, while some was swallowed, more was returned by the nose as a liquid. Interrogated as to his dysphagia, he states that it has existed to some extent for nearly a fortnight, but it is only during the four preceding days that it has seriously interfered with alimentation. The increase of the dysphagia day by day was, he said, the immediate and urgent reason for his seeking admission to the Hertford British Hospital. When asked as to the kind of food which he could most easily swallow, he at once replied, "A morsel of meat or bread." He then proceeded to explain that he had been gradually losing the power of swallowing liquids, and seemed to have almost entirely lost it for the last two days. He added, that a bolus of meat or bread was swallowed with greater difficulty on the day of admission than on the previous day.

On examining the heart and lungs very carefully by auscultation and percussion, no morbid signs can be detected, except such as are distinctly imputable to debility. Neither the diaphragm nor the muscles of the thoracic walls are paralysed.

One of the most striking features of the case at the first examination was the character of the voice—its weakness and nasality. After the examination had been continued for about a quarter of an hour, the patient's answers were given in a scarcely audible and curiously nasal whisper. Indeed, the facts of the case, as then reported, could not have been rightly elicited, had it not been for the presence of the patient's wife. During the examination, the pulse varied between 80 and 100: it presented no abnormal character except weakness.

Before proceeding with the narrative, it is well to state the tolerably precise conclusions which were at once arrived at, from the facts now stated, in respect to diagnosis, prognosis, and treatment.

The *diagnosis* was—*diphtheritic paralysis.* No doubt, the long-continued free use of the lead ointment suggested for a moment the possibility of the case being a mixed one—the conjoined result of galenic and diphtheritic poisoning. However, as the man had recently had diphtheritic sore-throat, as he had no blue line on his gums, and as his symptoms were exactly those which often manifest themselves as a sequel to diphtheria, his case was set down as one of diphtheritic paralysis.

The *prognosis*, under certain reservations, was favorable. The unfavorable circumstances were, the severity of the symptoms, and the prostrate state of the patient, taken in conjunction with the fact that the period during which the paralysis had existed was still too short to warrant the hope that it had attained its maximum. Had the duration of the paralysis and debility been considerably longer, and had these symptoms been also no greater than they were, the unfavorable element in the prognosis would have been much smaller. The favorable prognostics were, that the diaphragm and respiratory muscles were unaffected; that there nowhere existed any recognisable organic lesion; and that the debility of the patient being probably the result to a great extent of imperfect alimentation, it was likely to disappear under the judicious selection and careful administration of food, combined with the adoption of proper means for securing its digestion.

The *treatment* involved the adherence to important general principles, and the arrangement of numerous details in accordance therewith. Special treatment might or might not be tentatively employed at once; but, in any case, certain requirements were immediate and absolute—viz., faithful, intelligent nursing; suitable food, so administered as to obviate as much as possible the risk of choking; clearing out the torpid intestinal canal; and the use of means calculated to restore the mouth and pharynx to a wholesome state.

Special treatment, it was felt, might be advantageously allowed to remain undetermined for at least a few days, during which guiding opportunities might possibly be detected, such as not unfrequently occur in similar cases.

With the view of emulging the liver and unloading the torpid bowels, a pill containing four grains of calomel was forthwith administered. It was likewise directed that, two hours after he had taken the calomel pill, he was to take another pill containing four grains of the compound rhubarb-pill mass of the *British Pharmacopœia* and one grain of the extract of nux vomica; and it was likewise ordered that, if, as was expected, no stool were obtained within six hours, as large a quantity as possible of salt and water should be slowly injected. The ulcer on the pharynx was brushed with pure creasote, and the mouth was directed to be frequently swabbed with the glycerine of borax, and washed out once in twelve hours with a weak solution of alum.

Next morning (*February 22nd*), at my ordinary visit about 11 A.M., I found the patient's strength decidedly increased, and his general appearance improved. The feeding had been well managed; and he had had some hours of refreshing sleep, from which he was roused by severe abdominal pain, which had been partially relieved by hot fomentations.

There was great tenderness on pressure all over the abdomen, and greater distension than on the previous day. A small quantity of urine had been passed, which, tested by heat and nitric acid, was found to be moderately albuminous. With the double view of relieving pain and relaxing the bowel, and in aid of the action of purgatives already taken, the abdomen was freely smeared with an ointment consisting of one part of extract of belladonna and three parts of lard. In applying this ointment, gentle friction was employed. It was prescribed that, in the event of the bowels not having been moved within six hours, two drops of croton-oil should be given.

On the following morning (*February* 23*rd*), I found the patient very weak, although he had had a good deal of sleep and aliment. He was, in fact, recovering from extreme exhaustion, which had supervened on an enormous unloading of the bowels following the administration of the two drops of croton-oil. The evacuation consisted of indurated fæces slightly smeared with bloody mucus. During the passage of the fæces, there was intense pain in the abdomen and at the anus. The blood observed was in very small quantity; and proceeded no doubt from hæmorrhoids. No medicines were ordered.

On *February* 24th, the patient was greatly improved in countenance; he had neither pain nor uneasiness in the abdomen. There seemed to be some increase — there certainly was no diminution—in the paralysis and anæsthesia of the extremities. The difficulty in swallowing was less complained of, and was supposed by the attendants to be less than it had been since the patient's admission. The patient stated that his vision had been indistinct for the last two days—a fact which, when first mentioned, was attributed to the use of the belladonna ointment. There was some dilatation of the pupils. No medicines were ordered.

On *February 25th* (the condition being the same as on the previous day) I prescribed a blister to be applied over the larynx and sides of the throat, feeling certain that the exudative stage of the diphtheria being long passed, a safe time had arrived for making a vigorous trial of counter-irritation. I likewise prescribed two drachms of the compound tincture of cinchona to be taken three times a day in his wine, with (in each dose) five drops of the liquor strychniæ of the *British Pharmacopœia.* The rhubarb and nux vomica pill, full diet, and a daily *litre* of claret, were ordered to be continued.

Next day (*February 26th*) there was a marked improvement in the patient's voice: it was considerably stronger and much less nasal. This amelioration was probably due to the blister: at all events, I have seen blistering followed by a similar result in several similar cases.

From *February 26th* to *March 2nd*, no record of symptoms was made—an evidence that nothing particularly noteworthy had occurred; and on March 2nd, there is simply a note to the effect that the patient was then complaining of "increasing blindness." The next report is full and important.

March 5th. For some days, the patient has looked weary, and complained of great debility. His pulse is 84: his tongue is dry and coated. His bowels have not been moved for three days. Since February 25th, he has taken two drachms of the compound tincture of cinchona of the *British Pharmacopœia* three times a day, with five drops of the liquor strychniæ (*B. P.*); and, at dinner, a pill containing four grains of the compound rhubarb pill and one grain of extract of nux vomica. He has eaten abundantly till within two or three days, and has had a *litre* of claret daily. In respect of the general appearance, there is marked improvement. The improvement in the voice and power of swallowing, which began immediately after the application of the blister, has gone on increasing steadily ; and there now remains nothing abnormal in speech or deglutition. There is, however, a great increase of the paralysis of the arms and legs. Till to-day, he has been able to shuffle about the ward and use his knife and fork. To-day, he is absolutely confined to bed, being unable to get up even for necessary purposes.

There is almost total cutaneous anæsthesia of the upper and lower extremities. Both legs are very much more paralysed than at the date of his admission. There is less power in the left than in the right leg. He can voluntarily, but with much difficulty, draw up both legs to a certain extent; he can draw up the left less than the right leg. After he had drawn up his legs, at my request, five or six times, they were absolutely powerless. In about half an hour, the power began slowly to return to the legs. [I was informed next day that in two hours it was restored to the degree in which it existed before it had been exhausted in the manner now described.]

The paralysis of the arms and hands is almost as great as that of the legs. Both deltoids are shrunken and wholly useless. The grasp of each hand is exceedingly feeble; and, after a few seconds, the feebly grasped object falls from the hand. This was particularly observed when the nurse placed before the patient, on one of the hospital bed-tables, a plate containing a fork and some morsels of very tender meat. He managed, after two or three failures, to get the prongs of the fork into the meat; and, after a rest of one or two minutes, he carried the fork towards his mouth, at the same time meeting the morsel as it were halfway by bending down his body and head. Once or twice, he managed to get the bit of meat into his mouth, but generally the fork fell from his grasp before he could get the morsel within his lips. Whilst the nurse fed him, I proceeded with the examination of a patient in an adjoining bed, so that the whole of the feeding, occupying probably half an hour, was conducted under my immediate inspection. When I asked the patient to squeeze my hand with all his strength, I could only feel the slightest possible pressure. At the same moment that I recognised this slight pressure, I saw the patient's fingers encircling my hand, and could distinctly perceive by his countenance that, in obedience to my request, his volition to squeeze was at maximum intensity.

Finding that the bed was soaked with urine, which was dribbling from the penis, and finding by percussion that the bladder was enormously distended, I introduced a catheter, and thereby withdrew a large quantity of turbid dark-coloured urine, which, tested by heat and nitric acid, was found to be moderately albuminous. To prevent recurrence of over-distension of the bladder, which was not only the necssary consequence, but also the intensifying cause of the vesical paralysis, I have introduced a corked gum-elastic catheter, and so attached it as to remain in position. The nurse is directed, at intervals of four hours, to let the urine flow from the bladder by removing the cork from the catheter. By keeping the catheter closed, except when the bladder is being evacuated at intervals, the risk of the organ contracting upon, and being injured by the point of the instrument is obviated. On the other hand, the periodical evacuation at stated intervals is a security against over-distension. The cinchona and strychnia are suspended; the aperient dinner-pill, containing one grain of the extract of nux vomica, is continued; and a tumbler of Püllna water is prescribed to be taken every four hours till the bowels are freely moved.

March 6th. The Püllna water, aided by a clyster, thoroughly relieved the bowels at an early hour this morning. The patient looks better, but, in respect of the paralysis, his condition is the same, or worse. There is squinting in both eyes; and, on placing before the patient a book printed in large distinct type, he is surprised to find that he cannot read it. Unknown to himself, he has for some days been gradually losing the power of distinguishing small objects: even objects of considerable size he now sees indistinctly. For example, he cannot see whether the nurse has or has not a cap on her head. Besides the paralysis of the muscles which move and adjust the eye, he has palsy of the palpebral muscles.

On *March 7th and 8th*, the patient slept and ate well; and expressed himself as pleased and surprised at his great return of strength. On neither of these days did he take any medicines.

On *March 9th*, he was in equally high spirits. He said that he had slept well, eaten a good breakfast with a good appetite, and felt in all respects much better. His tongue was clean; his pulse was 76 and of fair strength so long as he remained recumbent. He felt confident that he could stand and walk. I allowed him to try. With great difficulty, he got his legs over the side of the bed. On attempting to stand, he slid down on the floor a helpless inert mass; and there remained till he was lifted into his bed. This unexpected display of muscular impotence caused him to weep. His condition was then carefully examined. He was found to have complete paralysis and anæsthesia of the upper and lower extremities. There was marked squinting of both eyes and very defective vision, depending evidently on muscular paralysis. There was also palpebral paralysis. There seemed to be great decrease in the vesical paralysis. That the degree of decrease might be accurately ascertained, I removed the catheter, and did not reintroduce it. I ordered a continuance of the full diet and daily *litre* of claret, which he had been having (and thriving upon) for some time. I directed that, till further orders, he should take no other medicine than the daily pill composed of one grain of extract of nux vomica, and three grains of the compound rhubarb-pill of the *British Pharmacopœia*.

The therapeutic opportunity seemed now to have fully arrived. Although alimentation was being satisfactorily conducted, and a general corresponding functional amendment was obviously taking place, it was evident that Nature's efforts were inadequate, and required to be judiciously assisted by art. There was, notwithstanding the conspicuous general improvement, a considerable progressive wasting of the paralysed muscles. There was, therefore, a risk that, if we did not soon excite movements of the affected muscles, their atrophy would proceed so far as either seriously to interfere with, or entirely prevent, a restoration of their powers The indications were to promote improved nutrition of the wasting muscles by directing towards them a greater supply of blood, and compelling them to involuntary, as a temporary substitute for voluntary, exercise.

I ordered gentle galvanic excitement of the nervous periphery of the superior and inferior extremities to be produced morning and afternoon, to such an extent, and in such a way, as to induce moderate action of the paralysed muscles. I likewise directed the whole circle of the muscles of the thoracic parietes and shoulders to be moderately kneaded twice in the twenty-four hours, the parts kneaded being at the same time well lubricated by a liniment composed of one part of tincture of cantharides, one part of British laudanum, and six parts of the British compound liniment of camphor. I likewise directed bands of linen, each one inch in breadth and smeared with a stimulating paste, to be applied at intervals of five or six inches to the whole length of the superior and inferior extremities, care being taken to change the position of the bands once, twice, or oftener in the twenty-four hours, so that, while the surface was kept glowing with warmth by the paste, its topical action on the skin should not be allowed to exceed the proper limit. The composition of the paste employed in this case was not exactly the same as I usually prescribe in similar cases. The formula requires to be modified according to the character of the skin of the patient, the duration of the application, and other circumstances. In the case now being described, the paste was composed of six drachms of powdered ginger and two drachms of English mustard, thoroughly rubbed up with just a sufficient quantity of lard to make a paste of suitable consistence.

On *March 11th*, the patient complained so much of continued pain in the limbs for hours after they had been galvanised, that the galvanisation was ordered to be discontinued; and as he attributed restlessness and sleeplessness on the two preceding nights to hot tingling sensations induced by the stimulating paste, I directed that the bands should be removed each evening at seven o'clock and not replaced till the morning when he awoke refreshed by sleep.

March 31st. The treatment prescribed on March 9th has been ever since steadily and rigidly carried out. Several slight vesications were on two or three occasions produced by the paste having remained too long in contact with the same surface. For weeks there has been no difficulty with the bowels. Tepid water enemata and a tumbler of Püllna water have, however, been occasionally required to supplement the rhubarb and nux vomica pill. In the legs, there is a great increase of power, more sensibility, and less numbness. He moves his legs in bed without much difficulty. He is still unable to stand for more than half a minute; and now (during the writing of this report) in attempting to do so, his legs gave way under him, and he slid down into a sitting posture. He is able slowly, and with occasional rests, to feed himself with spoon and fork, but he has not sufficient strength to use the knife to cut his food. His vision has much improved, and is daily improving. He has not the slightest difficulty in retaining or voiding his urine. The improvement has gone on so satisfactorily that it has been deemed unnecessary to recur to the use of galvanism.

The treatment is to be continued in all respects as at present; and, in addition, he is ordered to take three grains of the (*British Pharmacopæia*) saccharine carbonate of iron three times a day.

April 30th. He is able, with the aid of a stick, to walk about the ward. His general health is good, and his appearance is that of a man in perfect health. With the exception of taking the saccharine carbonate of iron as prescribed on March 31st, generous alimentation is now to be the only treatment.

On *May* 10*th*, the patient left the hospital in excellent health. He walked with the aid of a walking-stick to the cab, which I saw him enter without the slightest assistance.

On *August* 1*st*, he came by request to my house. He was then quite free from all trace of paralysis, in better health than he had enjoyed since the war; and was occupied with business involving a great deal of walking about the streets.

The case of S. M., which I have now so minutely described, affords in itself most of the elements necessary for a complete study of the paralysis of diphtheria. The history of no single case, however, can convey the whole truth regarding the natural course, pathology, and treatment of the affection. I therefore subjoin the leading features of another case which has occurred in my practice, and refer to the case of E. G. described in a previous chapter, in which the paralytic symptoms were mild; and the diphtheria—the original disease, if I may so express myself—was of maximum intensity, tracheotomy having been necessitated as the only means of saving life.

In the spring of 1873, I was consulted by A. B., a gentleman, aged 30, under the following circumstances. He came to my house from his hotel in a carriage, into which and out of which he told me he had got with great difficulty, arising, he said, from "rheumatism and weakness of both legs." He attributed his condition to cold and fatigue ten days previously, on his journey from Florence to Paris. In this opinion, he thought he was confirmed by having had some cough and sore-throat since his arrival in Paris, and at least a week before his limbs began to fail. He complained of dysphagia almost amounting to an inability to swallow liquids, and of being unable in the morning to see well enough to read the newspaper. After a good dinner and some glasses of sherry, he said, he could read print quite well. When he told me that he had just recovered from a very severe illness before he left Florence, I naturally and correctly concluded that the malady from which he had sufferred in Florence was diphtheria, and that the paralytic symptoms which had supervened in Paris were ordinary sequelæ of the primary affection. He informed me that his diphtheritic attack in Florence had been exceedingly severe in respect to the prostration of strength, but that the pellicle had not extended, he believed, from the pharynx into the larynx. The disease, in other words, had stopped short of "croup"—to adopt the phraseology of French physicians.

During the first few days under my care, the symptoms increased in severity. The patient was then taking cinchona and extract of nux vomica. The medication was discontinued, and, in place of it, Orezza water was prescribed. I directed it to be mixed with his wine at luncheon and dinner. He was unable to bear this strong ferruginous water, and discontinued its use after two days. Increasing dyspepsia now intervened, and seriously interferred with his alimentation. The paralytic symptoms continued, but did not acquire greater intensity: in some respects, they were less intense. He was falling into a very depressed state of mind and body, when, about ten or twelve days after he came to me, I ordered him to take before his two principal meals a pill containing three grains of pepsina porci, one grain of the saccharine carbonate of iron, and one grain of salicine. Under the use of these pills and a generous diet of varied meats, vegetables, and wines, he rapidly improved, and entirely recovered within four weeks from the day on which he first consulted me. The treatment and the natural curative course of the disease no doubt co-operated in the restoration of this patient. He soon afterwards left Paris, since which time I have not heard of him.

The cases E. G., S. M., and A. B., when viewed together, show that there is no relation between the severity of the primary symptoms, and the subsequent paralytic affections.

The causes and treatment of the Paralytic Affections of Diphtheria are reserved for further consideration in a separate article on the causes and treatment of similar affections during and after Diphtheria, Enteric Fever, and some other diseases.

VI.

PARALYTIC AFFECTIONS

DURING AND AFTER

ENTERIC FEVER.

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1875.]

PARALYTIC AFFECTIONS OF ENTERIC FEVER.

AFTER Enteric Fever, partial paralysis frequently supervenes. I have also met with cases of paraplegia supervening as a sequel to enteric fever. Paralysis, general or partial, much more commonly follows this disease than is generally supposed. Both in hospital and in private practice, I have repeatedly seen it overlooked during convalescence, from its being mistaken for, or masked by, general post-febrile debility. Generally, the paralytic affections are slight, transitory, and limited in character. Sometimes, however, they are very severe and long continued.

I subjoin the histories of two exceedingly interesting cases which I carefully observed and daily reported. They were both cases in which the diagnosis was certain, and in which the fever ran a course of great severity. The first case occurred in 1870, in my military practice during the German siege of Paris; and the other was treated by me in the Hertford British Hospital in 1874. I shall only mention briefly some of the other cases of a similar character which I have seen.

E. F. G., aged 24, was a well formed soldier of the Garde Mobile. He was sent into Paris on a frosty morning in December 1870, from one of the outposts, with a medical certificate to the effect that he was unfit for duty, and labouring under severe dysentery. He had been, in succession, refused at four hospitals before he came to me, including two great hospitals—La Charité and the Hôpital Beaujon. At that date, all the hospitals, civil and military, and much of the special ambulance accommodation, were overwhelmed with the sick and wounded. Both my hospitals were chiefly for wounded men; and the spare accommodation I had was being kept in reserve, in anticipation of a sortie. I, too, refused him; but, four hours after my refusal, he was returned to me with peremptory orders to receive him, as I had that day reported a certain number of beds unoccupied. The poor fellow had been jolted about for six hours over the then rough and deeply rutted streets of Paris on a bitterly cold day. I was in my ambulance at the Ternes when he was admitted. He looked a doomed and almost a dying man: his countenance was haggard: his pulse was feeble: his whole surface was cold: his respiration was jerking and shallow: his shirt, great-coat, and red trousers were saturated with his alvine evacuations, which had become frozen. A small blanket in which he was wrapped was also stiff with frozen filth. From the time of his leaving the outposts till I received him, he had taken only brandy-and-water, but of that he seemed to have had a large quantity. Two beds were forthwith prepared for him. His clothes having been taken off, he was quickly and entirely wrapped up in a large blanket wrung out of very hot water. Under this blanket, and in the recumbent position, he was carefully washed and scrubbed. After taking some beef-tea, he slept for half an hour. When he awoke, he was removed from the *wet* warm bed to one adjoining, which was *dry* and warm. The moving brought on vomiting, which, however, soon subsided. When I left him about nine o'clock, he had rallied somewhat, and had taken with satisfaction some tablespoonfuls of hot camphorated wine. The orders for the night were:—An astringent mixture if required; camphorated hot wine and beef-tea alternately at short intervals; and the continued application of turpentine stupes to the abdomen and legs. I saw him at seven next morning; he was lying on his side; his skin was naturally warm. He had had three dark liquid motions without any trace of blood. On the chest and abdomen, there was a characteristic and tolerably abundant eruption of the pink lenticular spots of enteric fever.

The case in its subsequent progress was in all respects a typical case of uncomplicated enteric fever. In thirty days from the date of admission, he was in full convalescence. A few days later, as we were short of hands, he was occasionally accepted as a volunteer assistant at the surgical dressings. All seemed to be going on well till the seventh week from admission, when he complained of inability to put on his coat, which he ascribed to rheumatism. A day or two later, his gait was dragging, and the grasping power of both hands enfeebled. For ten days longer, he was able to move about the ward; but during all that time his locomotive power was daily diminishing. At last, he had to keep his bed, after which time the paralysis advanced so rapidly that soon he was unable to get out of bed fo necessary purposes. There was paralysis of the external oblique muscle of the left eye for a week or ten days, and, on several occasions, there was atony of the bladder, requiring the use of the catheter. Notwithstanding the many disadvantageous circumstances incident to the siege, this man made a complete recovery. For several months, he remained under my treatment. At the close of the Second Siege, when the Government regained possession of Paris, he was sent to a military convalescent station in the country, whence he ultimately returned in robust health. During a great part of his residence at my hospital, the diet, from siege exigencies, was scanty and bad, but was supplemented largely by good red wine, which fortunately we could command in abundance. The internal treatment of this man, from the time the paralysis showed itself till it ceased, consisted in his taking fully two *litres* of excellent claret daily, and twenty drops three times a day of the tincture of the chloride of iron of the *British Pharmacopœia.* The external treatment consisted in the application of a succession of small blisters and sinapisms to the legs and arms. This counter-irritation, which produced very marked benefit, was maintained with more or less activity for five weeks.

The urine was albuminous immediately before and during the first ten days of the paralytic symptoms. During that period he lost to a considerable extent the flesh and strength which he had recently regained.

The following case—one of the most interesting of the class to which it belongs—I watched minutely throughout the whole of the primary and secondary symptoms. To be rightly appreciated, it must be studied in all its details, and compared with other similar and apparently similar cases.

Alice B., an English girl, aged 21, nursery-maid in an English family residing at Pasy, Paris, was admitted to the Hertford British Hospital on September 30th, 1874. She had then been only one month resident in France. For the three days immediately preceding her admission, she had been under treatment by a French physician, who intimated that she was suffering from a *fièvre muqueuse*, likely to be of considerable duration and severity. Under these circumstances, I was requested to receive Alice B. into the hospital.

The following is a summary of the history of the case from its commencement up to the time of my reception of the patient. For ten days she had felt weak and not up to her work; but till Saturday, September 26th, she did not state, or perhaps did not realise, that she was really ill. On that day she complained of severe pain in the back, and repeatedly had trembling fits. Her mistress, who accompanied her to the hospital on the morning of Wednesday, September 30th, when I received her, informed me that the patient did her work on the 26th, making no complaint of being unwell. On that day, however, her manner was observed to be peculiar. On the evening of the following day (Sunday, September 27th) she became delirious. Against her inclination, she was sent early to bed on that evening, where she remained under medical treatment till her removal to the hospital on the morning of Wednesday, September 30th. When she arrived, I was engaged in making the ordinary visit. As soon as she was undressed and somewhat rested, I proceeded to examine her.

September 30th, 1874, on admission. Her face is slightly flushed. Her expression is vacant and bewildered. The pupils are equally and much dilated. The respiration is oppressed. "Breathing tires me," she says. The pulse is 100, feeble; the temperature is 40·1° C. (104·18° Fahr.). The tongue is moist, clean at the tip and edges: in its centre there is a loose white fur. The bowels were much moved early this morning soon after a dose of castor oil. Some urine, passed an hour after admission, was found, on being tested by heat and nitric acid, to be slightly albuminous. The abdomen is moderately distended: it is nowhere tender on pressure. No gurgling can be detected in the right iliac fossa. There is no acute delirium, such as she is reported to have had on Sunday night. When first spoken to, her replies are hesitating, confused, and contradictory; when thoroughly roused, they become coherent; but, if questioned too long, she relapses into bewilderment. No medicines are prescribed. She is ordered to have the usual nutritious liquid diet of our fever patients, consisting chiefly of milk, beef-tea, and farinaceous substances, the milk greatly predominating. The maximum allowance of stimulants, till further orders, is fixed at twelve ounces of claret in twenty-four hours. As a common drink to allay thirst, she is ordered barley-water acidulated with lemon-juice.

October 1st, 11 A.M.—The countenance is more natural than it was yesterday. Her mental state is very similar. She had no sleep from the time of her admission till six this morning, when she fell asleep, and slept quietly for nearly two hours. She now complains of insomnia, and begs for medicine to induce sleep. The urine, still slightly albuminous, is pale, and passed in large quantity. There is some diarrhœa, but no increase of abdominal distension or tenderness. The pulse is 100, and feeble. The temperature about eight this morning was 39·8° C. (103·6° Fahr.); the pupils are dilated as yesterday. There is no eruption on any part of the body.—5 P.M. Seven very characteristic rosy lenticular spots are visible on the chest, which disappear on pressure and reappear when the pressure is removed. She complains of being weary from want of sleep, but does not seem restless or in bodily discomfort. She is ordered to have, at 10 P.M., a starch enema containing twenty-five drops of the *British Pharmacopœia* solution of the hydrochlorate of morphia.—8 P.M. The temperature is 40·8° C. (105·44° Fahr.).

October 2nd, 11 A.M.—Her appearance is very much the same as it was yesterday; perhaps there is more hebetude. She had several short sleeps of from five to ten minutes several times during the night. Since admission, no active delirium has been observed. There is no tympanitic distension, and very little tenderness of the abdomen. Since 5 P.M. yesterday, a few more rosy lenticular spots have appeared: they are situated on the back and arms. When there is a long interval between the doses of wine, the breathing always becomes oppressed: she asks eagerly for wine. The full allowance of twelve ounces of the best claret in twenty-four hours is being taken. She takes willingly a sufficient quantity of beef-tea and milk.—8 A.M. The pulse is 120, and the temperature is 39·8° C. (103·6° Fahr.). The diet and wine are to be continued as at present. She is to have a starch enema containing twenty-five drops of laudanum every night at 10 P.M. till further orders.—6 P.M. The pulse is 116, and the temperature 40·8°. No more spots have appeared.

October 3rd, 11 A.M.—Her general appearance is very similar to that which it presented yesterday. Though she has had very little sleep, she has remained tolerably quiet since having the morphiated starch enema. Once only during the night—for about half an hour—she was restless and delirious. She then several times addressed by name the children of whom she had charge before admission, rising up in bed and screaming to them, to warn them of some impending danger. No more fever spots have appeared. At 8 A.M. the temperature was 40·2° C. (104·36° Fahr.), and the pulse 116. At present, the pulse is 120.—8 P.M. There has been low muttering delirium during the day. The temperature is now 40·3° C. (104·54° Fahr.), and the pulse 120.

October 4th, 11 A.M.—The wine and diet have been continued as prescribed. The morphiated enema was not administered last night. She is at present free from delirium and is calm. During the night, however, she was very delirious, twice tried to get out of bed, struck the nurse several times, and made many complaints of being cruelly treated, particularly of being placed on a bed of rotten potatoes. In the early dawn, when she had been quiet for some time and was apparently emerging from a slumber, she was asked by the nurse if she felt better. Her reply was, "I am very weary; for, till I lay down here, I had been walking about the streets of Paris all night, seeking for, and unable to find, the hospital." She had a somewhat loose motion early this morning; but neither now nor since admission to the hospital has the looseness amounted to diarrhœa. About 8 A.M., the temperature was 39·7° C. (106·43° Fahr.), and the pulse 116.—4 P.M. She is very excited, and has been so since she received a visit from her late mistress at 2 P.M. The respirations are 36; the pulse is 124; and the temperature 40 C. (104° Fahr.). There is an icteric tint of the eyes and of the skin all over the body. The urine since yesterday has assumed a very dark colour, and to-day is quite like the urine of jaundice. She is reported to have had increased excitement immediately after the last two or three doses of wine. Orders are given to diminish the wine one half, if it seem to induce excitement. An enema containing twenty-five drops of the *British Pharmacopœia* solution of the hydrochlorate of morphia has now been administered, and another similar enema is ordered to be given at midnight.

October 7th, 11 A.M.—Since Sunday (the 4th) she has been restless, almost sleepless, and in a state of active delirium. She is at present delirious. She is now calling out to absent persons as if they were present, and manifesting a delirous loquacity very like that which is common in delirium tremens. The lower half of the left lung is dull on percussion, and in the same situation the breath-sound can scarcely be heard on auscultation. The respiration is short and shallow; and occasionally, for a few minutes at intervals, she has a paroxysm of very hurried breathing. From her extreme restlessness, jactitation, and subsultus tendinum, it is impossible to take the pulse, respiration, or temperature. There is slight abdominal tenderness on pressure, and a moderate amount of tympanitic distension. The urine and fæces are passed unconsciously. The urine —judging from the wetness of the napkins placed under her—is not scanty. The alvine evacuations are copious, black, and loose, but not watery. Her countenance has a wild nnd restless expression. Her pupils, which, since her admission, have been very dilated, are now more dilated than they have yet been, and are irresponsive to light. Her voice, like that of an inebriated person, is thick, and at times almost inarticulate. Since yesterday her wine has been increased to a *litre*, and to her hourly dose of wine two or three teaspoonfuls of brandy are occasionally added; the maximum quantity of brandy to be given in the twelve hours being three ounces. Immediately after taking a brandied dose of wine, she moved her tongue better, spoke much more clearly, and became less agitated. I asked her how she felt; when she at once replied: "Quite well. Are the boxes packed?" Several times since this report was commenced, she has exclaimed: "Are the children all right? Who are with the children?" Those questions are evidently suggested by the fretful cries of an infant in an adjoining ward. Her eyes are expressionless and never closed. She seems to see objects imperfectly, for she cannot tell me whether a chair near her bed is a chair or a table. She at times addresses her attendant as "nurse;" and at other times by the names of persons who are in England. At present, and occasionally at intervals, her delirium is characterised by loquacity and excitement. The lady-superintendent and nurses concur in stating that during the last three days there has been a well-marked periodicity in the maximum of her excitement, and that this has occurred twice in the twenty-four hours, viz. between 4 and 5 A.M. and 4 and 5 P.M. She is ordered to have, at 3 P.M., an enema, consisting of twenty-five drops of the solution of the hydrochlorate of morphia of the *British Pharmacopœia*, four drachms of spirit of turpentine, and one ounce of camphor water.—5 P.M. She is much quieter, a noteworthy fact, for lately the maximum excitement and jactitation have occurred very regularly at this hour. There is no increase in the abdominal tenderness. She is now in a profuse perspiration. Since the morning visit, she has passed unconsciously a consistent stool and some urine. She takes her wine with avidity; but now it is only almost by compulsion that she swallows milk or beef-tea. The milk, beef-tea, arrowroot, wine, and brandy are to be continued as at present. Another enema similar to that given at 3 P.M is to be administered at 10 P.M.

October 8*th*, 10 A.M.—The instructions of yesterday have been carried out in every particular. She slept very little during the night. The countenance has improved. She is now lying on her back with her eyes closed, but not asleep. When asked to open her eyes, she makes a visible unsuccessful effort to obey. She is placed from time to time on her side, but at once reverts to the dorsal decubitus, unless so propped as to render this impossible. There is no jactitation. The subsultus tendinum in both arms is incessant. Elsewhere at present there is neither subsultus tendinum nor muscular twitchings. At eight this morning her pulse was 120 and her temperature 39·5° C. (103·1° Fahr.).—10 A.M. The pulse is 120. The respiration is unequal in depth, and varies from 30 to 34 in the minute. When told to open her eyes and put out her tongue, she does both to the best of her ability, but very imperfectly. The eyelids separate slightly, and the tip of the tongue is shown at the half-open mouth. The pupils are still much dilated, but to a less extent than yesterday: they are sensible to light. The tongue and lips are parched and covered with black sordes. The speech is shaky, hesitating, slow, thick, and difficult to understand—much as it was yesterday. Since noon yesterday, she has had no stool. She continues to pass urine unconsciously: it does not appear to be scanty, but, being passed in napkins, it is impossible to estimate its quantity. From 11 o'clock last night till 7 this morning, she perspired profusely: the skin is still very moist. There is some loose cough, but no expectoration. The crepitant *râles* in the lower third of the left lung are much louder and coarser than they were yesterday: they are chiefly heard behind. Whilst this report was nearly finished, the patient, immediately after a brandied dose of claret, slowly opened her eyes, and said, "Am I better?" She had evidently been attending to the record which was being made of her symptoms. When I replied, "Much better," she smiled intelligently. This incident is specially noteworthy. Several physicians who have been present when I have interrogated this patient have supposed that, when I got no replies, that she was in a state of imperfect consciousness; whereas her not putting out her tongue when told, and not replying, has arisen from want of muscular power. To-day, till she had her wine twice, she could neither speak nor show her tongue. Two tablespoonfuls of castor-oil are to be immediately administered. The brandy is stopped, and in its place four ounces of rum are to be given in the twenty-four hours in milk. The wine and aliment are to be continued as at present, and the morphiated enema is to be repeated at 3 P.M.

October 10*th*, 10 A.M.—Her condition yesterday was very much the same as on the previous day. The bowels were relieved early yesterday morning by an enema of tepid water some hours after the administration of the castor-oil. The treatment ordered on the 8th has been continued till this time. Since last report, she has been gradually becoming less restless, and has several times given indications that she was interested in what was passing in the ward. She has been perspiring so profusely as to require several changes of linen in the twenty-four hours. The countenance is more intelligent, and her expression, when spoken to, shows that she understands what is being said to her.

Superficial examination might lead to an opposite conclusion; for she does not reply when spoken to, and when asked to put out her tongue, she makes no other sign of attempted compliance than a slight separation of the lips, accompanied by an earnest gaze which clearly declares, "I would if I could." She lies on her back, moving neither upper nor lower extremities, as if she were paraplegic. There is some difficulty in swallowing. Fæces and urine are passed involuntarily. There is no jactitation. There is subsultus tendinum in both arms, which is always at its maximum before, and at its minimum soon after, she has had a stimulant dose. The pulse is 124, and very feeble. The treatment is to be continued.—8 P.M. The pulse is 116, and still very feeble. In the morning, at 8, the temperature was 37·9° C. (100·22° Fahr.); it is now 38·8° C. (101·84° Fahr.).

October 11th, 10 A.M.—She passed a good night. A great change for the better has taken place in her appearance. Her countenance has nearly lost the remains of vacancy which still existed yesterday. She can somewhat protrude the tongue in obedience to orders; and answers with perfect intelligence—in one, two, or three slowly and carefully enunciated words—questions regarding her symptoms. The skin is very moist. At intervals, she has paroxysms of sweating so profuse as to drench her personal linen and soak the sheets of the bed. Yesterday, she seemed to have no voluntary power of movement in the limbs. To-day, she slightly moves her arms and legs when urged to do so; but after having repeated this performance at my request three or four times in quick succession, the motor power is now gone. She does not seem to experience any difficulty in swallowing.—8 P.M. When raised for a minute or two, about an hour ago, to a semi-recumbent position, she nearly fainted. Up to that time she had seemed stronger, and had been able, when requested, to flex, to a certain extent, her arms and legs. At 8 this morning, the pulse was 126, and the temperature 37° C. (98·6° Fahr.): at present, the pulse is 100, and the temperature 37·4° C. (99·3° Fahr.). The pulse is exceedingly feeble. The instructions now in force in respect to treatment are renewed, with this addition—that, *without being raised from the horizontal position*, she is, from time to time, to be placed alternately on either side; and that, in the event of a threatening of faintness, she is to have one or two tablespoonfuls of port wine.

October 12th, 11 A.M.—She had port wine several times during the night in consequence of her exceedingly exhausted state on awaking at intervals from sound sleep. She continues to perspire very freely, but the perspirations are not to-day of a drenching character. The tongue is cleaning. The state of the abdomen is normal. The urine and fæces are generally, but not always, passed involuntarily. The countenance is flushed. She takes large quantities of beef-tea thickened with tapioca or arrowroot, and a daily allowance of a *litre* of milk. Notwithstanding this alimentation, she is exceedingly dependent upon the free use of alcoholic stimulants. If not given in abundance, and at the exactly required time, she becomes alarmingly depressed; and has on several occasions seemed as if about to die from failure of the heart. On the 8th, 9th, 10th, and 11th, she had, each day, thirty-six ounces of strong claret, four ounces of rum, and six ounces of port wine. The quantity of stimulants is to be reduced should headache or flushing supervene.

October 13th, noon.—During the last twenty-four hours she has had a large quantity of beef-tea and milk. During the same period she has had also thirty-six ounces of claret, but no other stimulant. She is weak, exceedingly drowsy, and remains in a state of considerable perspiration. Her pulse is 64, and her temperature 37·7° C. (99·86° Fahr.). Occasionally, she has a little loose cough. The respiration is slow and weak, but she does not seem to experience any discomfort in breathing. The tongue is moist: it is clean except towards the root, where it is slightly coated with a brownish fur. There is neither tenderness nor distension of the abdomen. She has had no stool since the evening of the 11th. For some days past she has shown so great an aversion to beef-tea that she has taken much less of it; but to compensate for this, her allowance of milk has been greatly increased. During the last twenty-four hours she has drunk very nearly two *litres* of milk. Early every morning and afternoon she is to have an egg-flip, containing in each an ounce of brandy. During the twenty-four hours she is to have one or two small custards. Add to the beef-tea, in addition to the tapioca or arrowroot, two or three tablespoonfuls of a *purée* of mixed vegetables, viz. carrot, turnip, and Brussels sprouts. She is to have immediately a draught containing three drachms of (*British Pharmacopœia*) compound tincture of rheubarb, five grains of carbonate of ammonia, and an ounce and a half of camphor water, to be followed in three or four hours by an enema of tepid water, if the bowels have then not been moved.

October 14th, noon.—Yesterday the bowels were freely moved, after the rhubarb draught and enema had been administered as directed. If there be any change since yesterday in her condition, it is for the better. She takes her food well in accordance with yesterday's programme. The treatment in respect to food and stimulants is to be continued.

October 15*th*, *noon*.—During the early part of the night she slept well, but towards morning became wakeful, very hot in the head, and flushed in the face. These symptoms were relieved by the diligent application of cold water to the head. She is certainly in a less favorable state than when reported at noon yesterday. The aphasia is nearly complete. During the night and early morning she complained, in thick and difficultly understood speech, of severe pains in the arms and legs. The bowels have not been moved since the enema. The treatment is to be continued in respect to food and stimulants so long as they are taken willingly, and without causing increase of flushing or excitement.—4.30 P.M. The nurse reports that she has been yawning and sighing incessantly for the last three hours; she is doing so at present. There is cutaneous anæsthesia, and severe shooting muscular pains in the left leg, in which the motor power is less than in the right leg. In both lower extremities the power of voluntary movement is small, and is soon exhausted by being exerted. She feebly squeezed the hand with her right, and also with her left hand, when told to squeeze; but on her repeating the squeezing several times in succession, it was found that the amount of pressure went on diminishing, till at last it was not appreciable. When asked to show her tongue, she partially protruded it; but after protruding it several times she lost the power to do so. That she did her best was evident from her separating the lips and pushing the tip of the tongue against the teeth.

October 16*th*, 11 A.M.—The night nurse reports that during the greater part of the night there was considerable restlessness and stertorous breathing. Between 7 and 8 A.M., when seen by Mr. Baillie Cormack, the patient was not restless, but was breathing stertorously. Her pupils are now exceedingly dilated—much more dilated than I have yet seen them. There is complete aphasia. When asked if she had headache, she put her right hand to her head, and looked at me, as if she meant thereby to answer in the affirmative. This she did three times, looking earnestly at me at the same time, as if she would fain explain herself in words if she could. Her expression was that of perfect but anxious intelligence. She continues to pass her urine and fæces in bed; both are voided involuntarily, but not always unconsciously. About seven o'clock this morning, the nurse, when removing the soiled napkins from under her, observed that there was complete paralysis of the left arm and leg. At that time, the nurse assures me that neither leg was swollen, but that, two hours later, the right leg began to swell. It is now quite cold, has a glistening appearance, is very much swollen as high up as the knee. It does not pit much on pressure. On examination, I find that the patient is hemiplegic. The left leg is absolutely palsied: the right leg, on the other hand, is more under the influence of volition than either has been for some days. On tickling the sole of the left foot, it is energetically drawn up; and on the tickling being continued, the leg is almost convulsed. The right—the non-palsied leg—is very much less influenced by tickling the sole of the foot. Although the non-palsied lower extremity is responsive to the will of the patient, its motor power is very soon diminished, and is at last exhausted by continued use. In both lower extremities there is increased cutaneous and deep-seated sensibility, as is proved by a cry indicative of pain and a wincing of the features immediately following slight or firm pressure. The pulse is 128, and the temperature is 38° C. (100·4° Fahr.). The bowels are confined; the tongue is foul and dry. She is to have a saline purgative enema. The lower extremities are to be swathed in several folds of cotton wadding, and then packed up in warm flannels. India-rubber bags filled with warm water are to be kept close to the limbs, so as to maintain a warm equal temperature. Cold water is to be kept diligently applied to the head so long as its use continues to be, as it now is, soothing and agreeable to the patient. The wine is to be given very moderately so long as the heat of head and flushing of the face continue. She is to have milk and water as an ordinary drink; and milk diet and beef-tea as hitherto, except that the quantity of beef-tea is to be diminished so long as the heat of head and present high temperature exist. A cradle is to be placed over the legs to bear the weight of the bedding.

October 17*th*, 11 A.M.—The night-nurse reports that during the night the patient, on awaking from sleep and having a dose of wine, made several great efforts to speak, and succeeded to some extent, with thick voice and active eye, to express that she was suffering great pain in both legs. At 8 A.M. the pulse was 120, and the temperature 38·1° C. (100·6° Fahr.). At present the pulse is 100. The head is cool, and the countenance tranquil. The tongue is rather moist. The skin is dry, but not hot. The right—the non-palsied leg—has no longer a glistening appearance, and is now hardly at all swollen. The left—the palsied leg—has become very much swollen, as much swollen as was the right leg yesterday. There is no increase in the sensibility of its general cutaneous surface; but slight pressure, made in the course of the crural, internal and external saphena veins, causes the patient to move the limb with almost spasmodic energy, and to give evidence by the wincing of her features that great pain is being caused. The veins are invisible, from their deep-seated adipose position and the swollen state of the limb. Manipulation gives so much pain, that their state cannot be determined satisfactorily by tactile examination; but the touch nevertheless gives an impression that cord-like bodies exist in the course of the veins. By the exercise of voluntary power, the patient cannot move in the smallest degree the left upper or lower extremities. The mouth is drawn to the right side; but this is only slightly apparent when the countenance is in a state of repose, though strikingly visible when she smiles, which she has done repeatedly since this report was commenced. When asked to show her tongue, she protrudes it very slowly, very carefully, and with an air of deliberation, just as if she were performing an operation requiring adroitness and nicety of calculation: the tongue, however, is fully protruded. After she had exercised some minutes in protruding the tongue, its protrusion became increasingly difficult, and was at last temporarily extinguished. There is less aphasia. She has to-day a peculiarity of speech which I have not before observed. Her voice is still so thick that it is very difficult to recognise the words she employs; but she has a new peculiarity—the words are, as it were, thrown out of her mouth by a concentrated effort or jerk. Her intelligence is perfect. She asked and answered questions regarding her paralyzed state and her general condition in a correct discriminating manner, though much distressed by the physical impediment to speech. Her three principal complaints are, that she can hardly speak; that she has pain in a situation she indicates, viz. in the course of the left internal and external saphena veins; and that she is now stinted in her wine, without which, she says, she cannot utter words. She has some difficulty of breathing, but it is neither an urgent nor a constant symptom. The breath-sound is feeble posteriorly in both lungs, but is feebler in the lower third of the left lung than in any other situation. The alvine and renal evacuations are natural. The dingy yellow hue of the skin is disappearing. Let a large blister be applied to the front of the chest, and treated with poultice, cotton wadding, and linimentum calcis.—8 P.M. Visiting another patient, I casually asked A. B. how she felt. I am struck by the improved voice in which she has replied, "Much better." Her countenance is cheerful and natural. She has just taken a tumbler of milk containing an ounce of rum. On telling her to flex the forearm on the arm of the palsied extremity, I saw the biceps feebly but distinctly contract, the result of which was a corresponding slight flexion of the forearm. On a second trial, a similar result was obtained. A third and a fourth trial proved complete failures.

October 18*th*, 2 P.M.—She passed an excellent night. The countenance is very cheerful. The oppression in breathing seems nearly gone. The blister rose well, and has discharged an abundant serosity. The blistered surface is now covered with layers of wadding in the usual way. She remarked that she liked the blister, and hopes that she may soon have another. There is no swelling of the right leg. The left—the paralyzed leg—is much less swollen than yesterday, but it is still painful on pressure in the course of the veins. No indurated cords can be made out, but nevertheless it is possible that they exist.

The pupils, though still very much dilated, are less dilated than I have observed them since the hemiplegic attack. The skin is very moist, but for some days there have been no profuse perspirations. The dingy yellowness lately so apparent on the face, neck, and arms, is less to-day than it has been for a week. There is no longer any yellowness of the conjunctivæ. She can converse fairly well for two or three minutes, after which her speech becomes thick and embarrassed, and at last fails.

October 31*st*, 11 A.M.—Since the 18th, there has been a steady daily improvement. To-day she is sitting up for the first time. She can speak for a few minutes without being fatigued. The face, however, betrays the paralytic affection. She can, by leaning on a chair aud pushing it before her, move about a little, dragging the left leg. She has regained very little squeezing power in the left hand, but in this respect for some days past there has been decided amendment. Since the 25th, she has taken with her principal meal—ordinary hospital fare of soup, meat, and vegetables—a pill containing one grain of the extract of nux vomica, one grain of the saccharine carbonate of iron, and two grains of the compound rhubarb pill. She has likewise had every morning an enema of tepid water, by which means a satisfactory state of the bowels has generally been maintained. There is now a greater tendency to constipation. Her allowance of stimulants has for the last few days been one *litre* of claret in the twenty-four hours, and one ounce of rum. The latter is taken in a tumbler of milk when the morning movement of cleaning begins in the ward about seven o'clock. She is not now fed during the night, as she sleeps soundly without awaking.

November 1*st*.—She is progressing favourably. She is allowed to sit up some hours daily. She is to take one of the pills prescribed on the 25th after each of the two principal meals; and, when necessary, she is to have a tumbler of Pullna water as an aperient.

November 5th, 11 A.M.—Since November 1st till yesterday, her condition in respect of the hemiplegia has remained stationary. Her general state has been less satisfactory; but, till yesterday, except occasional complaints of frontal headache, there has been nothing in her symptoms to attract particular notice. She awoke yesterday morning with severe headache, flushed face, and dry tongue; and has not since been able to sit up for a short time, as she had been doing daily. Her relapse is probably the result of overeating, and having had more than enough wine. Prior to the 1st, she had for some days been quite ravenous for food. For wine, her craving was also inordinate. To satisfy these desires, she had been supplementing her own very abundant alimentation by using secretly wine and meat which other patients gave her from their superabundance. Her pulse is 120, and her temperature 39° Cent. The urine is rather scanty. The bowels are confined. She has no appetite. She is to return to a liquid diet, to discontinue the pills, and to have forthwith a tumbler of Pullna water. Till the headache and heat of head cease, cold water is to be diligently applied to the head.

November 9th, 11 A.M.—Both symptoms and treatment have continued very much as reported on the 5th instant till this morning, when some amendment in her state is observed. There is a slightly increased power both in the arm and leg. The headache continues, but is rendered bearable by the diligent application of cold water to the entire head. She still sleeps badly, but she slept better last night than for some previous nights. The bowels are moved once or twice daily—sometimes without, and sometimes with, the aid of Pullna water and an enema. The tongue is cleaning. The respiration is natural. The skin is soft, but not moist. The pulse is 104, very compressible; the temperature is 37° C. (98·6° Fahr.). She refuses her food, but takes wine greedily. A very careful examination of her state has now been made. The veins are rendered invisible by the swollen state of the limb and their deep-seated subadipose position. Digital examination occasions so much pain, that it cannot be satisfactorily employed to determine their condition; but it is nevertheless correct to state that the touch gives to a certain extent the impression of cord-like bodies existing in the course of the veins. There is not the slightest voluntary motor power in either the upper or the lower left extremity. The mouth is considerably drawn to the right side: this is much less apparent when the countenance is in a state of repose: it is very striking when she smiles, as she has often done during the preparation of this report. When asked to show her tongue, she protrudes it very slowly and with an air of thoughtfulness, as if she were performing an operation demanding the exercise of the greatest skill. The protruded tongue deviates to the right.

November 16*th*, 11 A.M.—Since the 9th instant, there has been a distinct daily amendment in all the symptoms. To-day she is ordered to have ordinary diet. The only addition to the ordinary allowance of food and wine is a continuance of the morning ounce of rum in a tumbler of milk. She sits up daily for an hour.

November 17*th*, 11 A.M.—She is up and dressed. She looks well. The pupils are now very moderately dilated. The tongue is clean. The pulse is 70. She speaks without hesitation, and her articulation is distinct and perfect. She cannot, unless supported, take more than three or four steps: even when supported, her gait is very unsteady, and the left leg is slightly dragged. She says that she has not quite as much power in the left arm and hand as in the right; but she uses both arms apparently as well as other people, and the grasp with the left hand is not weaker in proportion to the grasp with the right hand than is usual.

December 1st.—She is now quite well. Except a very slight weakness in the left leg, no trace of any paralytic symptoms remains. The rum and milk are now to be discontinued.

December 8th.—No trace of the paralytic symptoms remains. She can walk up and down stairs. The catamenial discharge has returned to-day in a normal manner after missing three periods.

December 16th.—She has remained since the 8th free from any paralytic symptoms or local weakness of any kind. She leaves the hospital to-day, plump, and in excellent health.

On every occasion in which the *temperature* was taken in this case, the thermometer was introduced into the axilla.

The *cold affusion* was frequently used in the case of Alice B., in a modified form throughout the pyrexial period, and generally with the result of abating restlessness, and sometimes of inducing sleep. For these purposes it is invaluable; and to them I now limit its use in the treatment of enteric and other fevers. It is unattended by risk, so long as the patient is kept in the horizontal position, and not subjected to any process involving fatigue. In private practice the construction of the bed and the want of an intelligent nurse, frequently render it difficult to freely apply cold water with convenience and safety to fever patients. The conditions under which I like to use the cold affusion in fever are simple:—the patient on a common narrow iron bed—the bedding protected by a strong waterproof sheet drawn under without raising the patient—the overhanging part of this sheet so arranged in gutters as to direct the used water into suitably placed vessels—the affusion being made either by a hand shower-bath, by squeezing a large sponge, or by pouring the water in a full, gentle stream from an ordinary wide-mouthed English bed-room ewer. The temperature which is pleasant and useful in one case is not so in all. As a general rule water at 40° F. suits well; and a lower temperature is seldom necessary or proper. I was once in the habit of using the cold affusion in a much bolder way, imitating the old and well-known practice of Currie, which I may remark has been lately brought out in Paris as a novelty, with the view of diminishing the intensity and the natural duration of the fever. I cannot believe that any treatment will produce the latter result.

In recording the case of Alice B. I have but slightly abridged the original reports, believing that complete histories of complex cases which have been carefully observed from first to last afford valuable materials for clinical analysis and comparison, and that abstracts are seldom reliable for such purposes. Abstracts are apt to be misleading, from giving undue prominence to the facts which most support the author's particular views. A desire to avoid this evil, and to enable readers to form their own conclusions, is my reason for having given details which some may regard as unnecessary and tedious.

The paralytic affections observed in the case of Alice B. present important differences from those which occurred in the case of E. F. G., the young soldier of the Garde Mobile. Both were cases of paralysis following enteric fever; but nevertheless, the paralytic manifestations and their causes were in each considerably different. In the soldier, the paralysis depended probably only on asthænia: certainly, in his case there was nothing decidedly indicative of a plugging of blood-vessels. There may nevertheless have existed a temporary impervious condition of some deep-seated vessels giving rise to the paralysis as a consequence of imperfect nutrition of muscles and nerves. Be that as it may, the case in its more obvious clinical aspects and indications of treatment closely resembled one of diphtheritic paralysis, except that the veil of the palate was not affected. On the other hand, in the case of Alice B., the servant girl, the phenomena and their causes were of a mixed character. The patient was in an asthenic state; and had likewise vascular obstruction.

VII.

TREATMENT
OF THE
PARALYTIC AFFECTIONS
OF
DIPHTHERIA AND OTHER DISEASES;

WITH REMARKS ON THEIR PATHOGENESIS AND CHARACTERISTICS.

PARALYTIC AFFECTIONS OF DIPHTHERIA AND OTHER DISEASES.

In studying the Treatment of Paralytic Affections frequently associated with Diphtheria, it is necessary to take an enlarged clinical view of kindred diseases. We must bear in mind that paralysis in different forms and degrees is an occasional concomitant or sequel of the puerperal state, of the morbid state called hysteria, of various acute diseases, and of all conditions characterised by asthenia.

In the *Gazette Hebdomadaire de Médecine* for 1859, Dr. Landry published an account of a case of generalised paralysis which set in during convalescence from pneumonia and terminated in death. The case occurred at the Hôpital Beaujon of Paris, in the wards of Professor Gubler. Dr. Landry's narrative is followed by remarks of Professor Gubler, which conclude by a statement to the effect that a paralysis similar to that which occurs as a sequel of diphtheria may supervene as a secondary result of numerous maladies very different from one another, but all producing exhaustion of the nervous system, impoverishment of the constitution, and a lowering of organic power—conditions favourable to the production of permanent disorder of the innervation. On the appearance of this case, Dr. Macario of Nice laid claim to priority in a communication published in the *Union Médicale* of Paris for November 8th, 1859. He there gives the details of four cases of pneumonic paralysis. Dr. Macario's cases are given in his work on *Dynamic Paralysis*, which received a meed of honour from the Academy of Sciences of Montpellier, and was published in the *Bulletin Général de Thérapeutique* for December, 1850. Many authors, writing before and since that date, have described cases of pneumonic paralysis. To priority in the publication of such cases, Professor Gubler lays no claim. The important claim to priority which he does put forth is that of having first established, that generalised paralytic affections occur as secondary results of all the diseases of short duration entitled from their severity to be called acute. Under the term "acute diseases" (*maladies aigues*) he includes only the diseases properly designated fevers, and the inflammatory diseases accompanied by fever. He has, I think, established his proposition that all the diseases embraced in his restricted category of "acute" may induce local or general paralytic affections during their evolution and after the cessation of their active manifestations.[1]

A similar opinion is expressed by Dr. E. Fritz in his valuable work on the different symptoms referable to the spinal cord which frequently occur in the course of typhoid fever. He strongly dissents from a view put forth by Drs. Lombard and Fauconnet of Geneva, to the effect that typhoid fever, to the exclusion of the acute diseases, possesses a monopoly of spinal symptoms. He admits that affections of the nervous system in various forms and degrees (including paralytic affections) occur in the course of, as well as during convalescence from, erysipelas, pneumonia, pleurisy, and bronchitis.[1]

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[1] GUBLER (ADOLPHE):—Des Paralysies dans leurs rapports avec les maladies aigues, et spécialement des paralysies asthéniques, diffuses des convalescents. (*Archives Générales de Médecine*: 1860.)—"Le seul mérite que je puisse revendiquer est d'avoir, le premier, je crois, élevé au rang de fait général la production des paralysies généralisées comme effet secondaire de toutes les affections de courte durée vraiment dignes par leur intensité du titre de *maladies aigues*."

In my account of the RELAPSING FEVER as I saw it in 1843, in the first months of that most remarkable epidemic, I mention that paralysis of the deltoid and other muscles occurred in a few cases. In a woman, aged 36, there was loss of power in both deltoids, which continued for about ten days after restoration to health had taken place in all other respects.[2] As my fever patients, on leaving the hospital, generally ceased to be under my observation, I had comparatively few opportunities of studying paralysis and the other sequelæ of relapsing fever. In later writings on relapsing fever, I find notices of partial paralysis having occurred during convalescence in the practice of various observers. It is probable, therefore, that had not my patients passed from my observation so soon after recovery, I should have seen a larger number of post-febrile paralytic affections in the Edinburgh fever of 1843.

Dr. Richard T. Lyons, of the Bengal Army, in his very valuable Treatise on *Relapsing or Famine Fever*, published in London in 1872, says that paralysis is more commonly associated with that fever in India than in Europe. In this opinion, he is probably correct. Possibly, however, the Indian fever epidemics which, from the published descriptions Lyons considers to have been epidemics of relapsing fever, were not all of that nature using the term *relapsing fever* in the special and restricted sense in which clinicians have employed it for the last thirty years. Be that as it may, it is evident that many of the Indian epidemics in question were essentially similar in kind to well-observed and accurately described European epidemics of relapsing fever. But, even supposing that the fever known in Great Britain under the name *relapsing*, is not the same as any Indian fever, the following extract from the work of Dr. Lyons furnishes, in a concise form, some most interesting and precise statements in proof of the frequency with which various forms of paralysis have been observed as *sequelæ* of fevers in India. Such statements strengthen the opinion that there is nothing absolutely *sui generis* in the paralysis of diphtheria.

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[1] FRITZ (E.): Etude Clinique sur Divers Symptômes Spinaux observés dans la Fièvre Typhoïde, 8vo, pp. 186. Paris: 1864.

[2] See Vol. I, p. 215.

Again, at page 148 of his Treatise, Dr. R. T. Lyons says :—

"In the Kimedy epidemic of 1833, M'Donell met with two cases in which paralysis supervened, and in one of these there was also anæsthesia or numbness ; in both, the paralysis occurring during convalescence. In the Mercara epidemic of 1842, Lawrence says that several patients experienced loss of power and sensation in the lower limbs, and walked with a tottering gait, these symptoms being sometimes preceded and sometimes followed by œdema of the feet and hands. In the Mangalore epidemic of 1845, the same author found paralysis to be a frequent complication, and he further states that convalescence from paralysis was protracted and retarded by a temporary recurrence of the earlier symptoms : whether these were increase of circulation, œdema, or febrile heat, the paralytic symptoms were always increased at the same time. Eyre met with three cases of palsy, which were mistaken for beri-beri; all these proved fatal. In one case, the paralysis occurred in the primary fever, in another during the intermissions, and in the third in the relapse. In the Umballa epidemic of 1866, Bateson found one of his two cases of hæmorrhage of the bowels affected with facial paralysis. Gray likewise met with a few cases of partial paralysis in the epidemic in the Lahore Gaol in 1864. Hugh Clark observed one case of dysphagia. In the *Indian Medical Gazette* for April, 1867, Garden describes eighteen cases of partial paralysis in children after fever. I consider the disease, from Garden's description, to have been relapsing fever, for the following reasons:—the duration of the fever, from two to eight or ten days, is more consonant with the character of relapsing fever than of typhus or typhoid, the former, moreover, being rare in India and the latter rare in Upper India, where Dr. Garden's cases occurred. In his account of Saharunpore epidemics of 1869-70, he states that the disease was of annual and constant occurrence in his district. It is probable that it was occasionally prevalent in 1866, in which year Garden made these observations. In the eighteen cases, paraplegia occurred in ten, paralysis of the left leg in one, of the right wrist in two, of the left arm in one, of the pharynx in one, and hemiplegia in two. All these cases occurred during convalescence. There was a natural tendency to recovery after an indefinite duration; but the more protracted cases became permament."

Here we find two very strong points of similarity to diphtheritic paralysis: the "natural tendency to recovery" and the tendency of the "more protracted cases to become permanent." It is not inconsistent with a belief in the tendency to natural recovery to state that protracted cases sometimes become permanent.

Permanence of the paralysis following diphtheria and various fevers depends generally on atrophy of the muscles caused by protracted disuse—the mere continuance of the paralysis becomes in fact a new morbid cause preventing natural recovery. A vigilant physician, with full command of his therapeutic opportunities, will often succeed in preventing protracted cases from becoming permanent.

There is an excellent paper on temporary glycosuria by Mr. William Sedgwick, in the *Medico-Chirurgical Transactions*, founded on observations which tend to prove that there had existed in CHOLERA paralysis of the abdominal sympathetic nerve prior to the glycosuria, and that the occurrence of the latter would serve to show that, during reaction from previous collapse, there is "a temporary excess of restorative effort."

It is well known that patients convalescent from cholera, in common with persons recovering from various diseases, often require the catheter to be used, in consequence of temporary paralysis of the bladder. Dr. Sutton has noted (page 412, of *Simon's Ninth Report to the Privy Council*, 1867), that "in more than one case four or five pints of urine were drawn off in twenty-four hours." He gives in detail the case of a woman, aged 39 years, whose husband and three children died in the East London Cholera Hospital from the disease. The woman was attacked with cholera at 2 A.M. on October 6th, 1866, and was admitted to the hospital at 7 A.M. on the same day. After a residence of nineteen days, she was dismissed in full convalescence. It is specially stated, in the history of this case, that, at 3 A.M. on October 16th, three pints, and on the 17th a similar quantity of urine was drawn off.

Dr. Henri Jaubert, in his thesis (Paris, 1866), *De la Convalescence du Choléra*, states that he had had the opportunity of observing 888 patients of both sexes and of all ages in a temporary asylum established for the reception of convalescents from cholera. Under the heading, "Accidents Nerveux," he gives three classes of cases; viz.: 1. Cases of cramps of limbs; 2. Cases of contractions of the extremities; 3. Cases of different forms of paralysis. In this last division, after referring to the observations of Dr. Mesnet (*Archives Générales de Médecine*, Fév. et Mars, 1866), he relates the case of a man, aged 60, who during the course of the malady, was all at once attacked with weakness (*faiblesse*) in the entire right side of the body, including the face. When the patient was first seen by Dr. Jaubert, the right naso-labial sulcus was slightly obliterated, the commissure was depressed, and the tongue deviated slightly towards the right. It was with the utmost difficulty that he could make any use of the right arm and leg. He was, however, able to stand, and, with the assistance of a crutch, he could take some steps. He walked like a mower, advancing one foot before the other. There was inertia of the bladder (*vessie paresseuse*). After eight days' residence, the patient left the Convalescent Home in the state now described. It is to be regretted that this case remained under observation for so short a period.

Dr. Jaubert mentions another case of hemiplegia following cholera, which he had seen, but of which he did not take notes. In this case, the paralysis suddenly manifested itself at the commencement of reaction.

Dr. Jaubert likewise mentions having seen two cases of incomplete paralysis of motion and sensation. The subject of the first of these cases was a male patient in the Convalescent Home. When admitted, there existed nearly complete insensibility of the little finger and ring-finger, and of the inner half of the middle finger: the prick of a pin was not felt unless a deep thrust were made. The gentle friction of the arm with anything was not perceived by the patient. The anæsthesia extended up to the elbow, but it was less in degree in proportion to the nearness of the situation to the elbow: it was limited to the cubital half of the arm. In the right foot, the two outer toes and the external half of the third toe were similarly affected. In the left foot, the affection was limited to the great toe. The paralysis did not extend to the leg on either side. The motor power was modified in a similar manner to the sensation. The patient could neither flex nor extend the affected fingers and toes. The paralysed parts were the seat of an unpleasant formication. This case was under observation during only a part of its course. The history concludes with the statement that, when the patient left the Convalescent Home at his own request, he was more paralysed than on admission. In the other case, there was no loss of motor power; and the anæsthesia was limited to the distal half of the ring-finger and little finger of both hands.

Magendie, in his *Leçons sur le Choléra*, published at Paris in 1832, refers to paralysis as a sequel of cholera. He stated that the way in which it begins to manifest itself is generally so gentle, that the patients seem to experience only extreme debility and a dislike for food. In about eight days, he says, they pass into a state of profound prostration: the muscles of the face become paralysed, and those of the limbs become quite flaccid. The mental powers grow torpid; there is progressive destruction of all the vital powers; and at last death takes place.

The epidemics of 1849 and following years furnished numerous cases in which paralysis was secondary to cholera. Gubler refers to a series of lectures delivered in 1849, at the Bicêtre, by Dr. Delasiauve, upon cases in which attacks of cholera had been followed by mental alienation and paralysis.

Dr. O. Landry, in his work *Sur les Causes et les Indications Curatives des Maladies Nerveuses*, states that, during the cholera epidemic of 1849, a man suffering from a formidable attack of the disease was admitted, under the care of Piedagnel, to the hospital of La Pitié at Paris. Early in convalescence, paralysis invaded the superior and inferior extremities, without the occurrence of any symptoms of the nervous centres being involved. Micturition and defæcation continued to be performed in a normal manner. The muscles became atrophied. Treatment having proved unavailing, the patient was transferred to the Bicêtre as an incurable.

Briguet and Mignot, in their *Traité du Choléra Morbus*, published at Paris in 1850, mention three cases which occurred during the epidemic of 1849, in which partial paralysis manifested itself in convalescence from cholera. In one of these cases, the paralysis was limited to the hands. In the two other cases, the superior and inferior extremities were affected: in both cases, the paralysis first showed itself in the superior extremities. In the three cases, recovery from the paralysis took place. Gubler, in referring to these cases, remarks that it is noteworthy that restoration of power commenced in the hands, and that the paralysis remained longest in the feet and legs—noteworthy, because the same order in recovery is observed in the paralysis consecutive upon diphtheria and other acute diseases.

DYSENTERY has sequelæ similar to cholera in respect to sensation and motion.

Early in the morning of the 22nd April, 1872, I received a telegram requesting me to meet in consultation Dr. Bazard, at Dijon, in the case of an English gentleman, who was laid up at an hotel in that town, unable to proceed on his homeward journey from Egypt to London. I reached the bedside of the patient between five and six o'clock on the afternoon of the 22nd. He had, I was told—excepting occasional remissions lasting for a day or two—been severely suffering for some weeks from dysentery. During the whole of that period, he had been travelling homewards by short stages, suiting his journeys as much as possible to his ebbing strength. His paramount idea had evidently been to get home to obtain efficient treatment; for he had only casually consulted physicians on the way, and had never placed himself under serious treatment till his arrival at Dijon, when it was too late. At the date of my visit, the sanguineous alvine flux had entirely ceased, there remaining, however, a very irritable state of the intestine, manifested by diarrhœal stools quickly following the reception of food into the stomach, if more than two or three tablespoonfuls of beef-tea, panada, or thin arrowroot gruel were taken.

The cessation of the dysenteric flux had not been followed by any restoration of strength or other sign of real amendment. On the contrary, the debility had alarmingly increased during the preceding two days, and within that period there had also supervened, or at least there had been first observed, inertia of the bladder, partial paralysis, of the lower extremities, and cutaneous anæsthesia. When I arrived, there was anæsthesia and incomplete motor paralysis of both legs. There was no impairment of the motor or sensory power of the superior extremities, or of the muscles of the face, tongue, or œsophagus. The intelligence was not affected. The urine was scanty and slightly albuminous. The pulse was about 90, weak, and intermittent. My questions were answered fully and clearly. I passed the night in an adjoining room. The door between the two rooms being ajar, I heard all that passed. He spoke to the nurse at intervals in a distinct voice, and took beef tea, arrowroot, and wine, when they were offered, at short intervals. I was twice summoned to his aid during the night, in consequence of his being attacked by dyspnœa. On both occasions, he obtained considerable relief from the application of large thin poultices of linseed-meal and mustard to the thoracic parietes. When I left early in the morning for Paris, he had just awoke from a short sleep. He concurred with me and Dr. Bazard in thinking that he was in a rather better state than on the previous day.

On arriving at my house in Paris, I found a telegram waiting for me, dated noon, requesting me to return to Dijon. I made my arrangements to do so; but another telegram, dated 3 P.M., informed me that the patient had just expired. I afterwards learned that death, till within an hour of its occurrence, did not appear imminent. Dr. Bazard attributed the fatal issue to general prostration and paralysis of the respiratory muscles. Death was not preceded by delirium.

Recently, I was consulted by a military officer passing through Paris, on his way home from India on sick leave. He had suffered severely from dysentery, followed by debility and great loss of power in both inferior extremities, which, he said, at one time amounted to complete paralysis. When I saw him, he could walk with the aid of a staff. He had a very anæmic appearance, and was suffering much from constipation. He was taking citrate of iron and quinine, which I recommended him to continue, with the addition of a dinner aperient pill, containing a grain of the extract of nux vomica. I saw this patient only twice; and have had no opportunity of knowing anything of the course of his malady subsequently to my last interview with him.

Zimmermann says that, in some persons who have had severe attacks of dysentery, it is not unusual in convalescence to meet with paralysis of the mouth and tongue, and sometimes of the whole of the lower part of the body. Sometimes, he says, universal paralysis manifests itself simultaneously with the cessation of the dysentery. He does not describe any individual cases.[1]

I have had several patients under my care for paralysis of the rectum, who traced that affection back to severe dysenteric attacks of old date.

The frequent occurrence of intractable inertia and paralysis of the rectum after dysentery has led some authors to attribute this inertia and paralysis to dysenteric lesions of the intestinal canal. A fact of kindred character is noteworthy in the present inquiry; viz. that paralysis following dysentery attacks the inferior more frequently than the superior extremities. As a rule, in paralysis of cerebral origin, the superior extremities suffer most severely and far more frequently.

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[1] ZIMMERMANN:—Traité de la Dysentérie: traduction Française, p. 13. Lausanne, 1794.

Various affections of the nervous system occur during and after attacks of SMALLPOX. Sometimes the nervous centres are implicated; at other times, we have more or less transitory conditions of paralysis, such as are met with in diphtheria. According to Gubler—who has collected and commented upon a very interesting series of cases—the paralytic affections (as also the convulsions) which occur during the period of invasion or at the onset of the disease, are less dangerous than those which supervene at its termination or during convalescence. The paralytic affections, he remarks, which declare themselves at the period of desquamation, are more protracted and serious than those which declare themselves at the onset of smallpox, and those which occur at an advanced period of convalescence are of still longer duration and of a more intractable character. They are sometimes incurable when they become localised in the lower extremities. The following statement of Gubler is true and of great importance in relation to the whole subject now before us. He says: "Secondary paralysis following measles, scarlatina, and smallpox, are essentially connected with general asthenia; they disappear when it disappears under the influence of a regimen suited to restore the strength of the patient and recuperate his economy."[1]

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[1] GUBLER (Adolphe):—Des Paralysies dans leurs Rapports avec les Maladies Aiguës, et spécialement des Paralysies Asthéniques, Diffuses

Gubler quotes a very interesting case of paraplegia su
vening during the incubation of smallpox, reported by
Raoul Leroy d'Etiolles in the chapter of his work on
lysis of the Lower Extremities, which is devoted to the
sideration of paraplegia in severe fevers. On the app
ance of the eruption, the paraplegia ceased. Nume
abscesses formed, and there was a pellicular phlegmas
the mouth and nasal fossæ. This state was followe
paralysis of the veil of the palate, difficult breathing, p
monia, and death. At the necropsy, no lesion of
nervous centres could be discovered.

The following case (also quoted by Gubler) occurre
1854 in Trousseau's service at the Hôtel Dieu of Paris
give only a summary of the leading facts. A woma
vaccinated subject, was attacked with confluent small
During desquamation, she was seized with sudden
complete paralysis, and a diminution of sensation in
lower extremities. The eruption, which was abund
appeared on December 25th, and ran its natural co
On January 6th, the patient was convalescent, taking f
and able to leave her bed for two hours. On January
she had loss of sensation and motion of the lower extr
ties and abdominal muscles, extending on both sides u
the breasts. The left superior extremity was likewise p
lysed from the finger to the middle of the humerus. T
was retention of urine. The respiration was very labor
and very rapid. On January 16th, there was orthopn
exceedingly quick breathing, and acute pain when pres
was made over the dorsal region of the vertebral colu
There were likewise lancinating spontaneous pains in

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des Convalescents. (*Archives Générales de Médecine*, 1860, vol.
551).

cervical region. There was almost complete motor paralysis and absolute insensibility of the left arm. The anæsthesia of the trunk was mostly on the left side, where it existed as high up as the nipple. There was a total loss of voluntary motor power in both lower extremities, retention of urine, and incontinence of the fæces. On January 18th the patient died. On that day, there was an apparent amelioration in the state of the patient; but afterwards, a fatal suffocative attack supervened. At the necropsy, it seemed doubtful whether there was any cerebral congestion; and not the slightest alteration could be detected in the membranes or substance of the brain.

Most probably, had this patient died at a later stage of the paralysis, lesions of the nervous centres would have existed. The duration of the paralysis has to be taken into account when we come to estimate the pathological significance of lesions of the nervous centres in cases of paralysis following diphtheria, smallpox, fevers, and other acute diseases.

The following case bears a remarkable similarity to cases of paralysis following diphtheria and terminating in recovery. It occurred in 1859 in the Hôpital Lariboisière of Paris, under the care of Dr. Pidoux, by whom it was communicated to Gubler, who published it in the memoir (p. 548) from which I have extracted the preceding case.

The patient was an unmarried healthy man, twenty-five years of age, who had been vaccinated. During the desiccation of the pustules he became affected with snivelling, and the drinks he took were returned by the nose. The paralysed veil of the palate floated like a flabby inert mass. The patient, it must be remarked, had not had any notable sore throat in the course of the smallpox or during the period of invasion. The affection of the palate was soon succeeded by acute pains accompanied by cramps in the left triceps femoris, and in a few days the right quadriceps femoris was similarly affected. These pains were succeeded by almost total paraplegia. Walking was impossible. For fifteen days the paralysis did not extend; but, at that date, both arms became simultaneously enfeebled. He was unable to lift a small weight, and could not squeeze an object placed in his hand. His strength was prostrate, and he was in a state of low spirits. The external treatment consisted in stimulating frictions and sulphur baths. The internal remedies employed were cinchona and coffee. There was a gradual return of power to the veil of the palate, then to the lower extremities, and lastly to the upper extremities. Recovery occupied rather more than two months. Ultimately the patient left the hospital strong and well. This case has many points of resemblance with the case of S. M., treated by me in 1874, in the Hertford British Hospital.[1]

A case of smallpox has been published by Westphal in the *Berliner Klinische Wochenschrift* for 1872 (No. 47), in which there was paralysis. On dissection, there was found a state which the writer terms *disseminated myelitis.* A man, aged 32, was, after some preliminary symptoms, seized with smallpox on January 24th. The eruption was non-confluent and moderately abundant. On February 4th, there was incontinence of urine; next morning, on awaking, the patient found that he had numbness and complete motor paralysis of the left leg; on the following morning, the right leg was also paralysed; there was an inability to retain the fæces, and a death-stricken sensation in the abdomen. On February 10th, the patient was placed under the care of Dr. Levinstein, who found paralysis of the bladder, complete paralysis of both legs, and a great diminution in the sensibility. The muscles responded well to the influence of induction currents. Subsequently, the patient had cystitis and sloughing over the sacrum. He died on March 5th. At the autopsy, the membranes of the spinal cord were found free from lesion. The grey matter of the spinal cord was congested, and some sections of it in the lumbar region presented, on the right and the left, dark spots of various shades. The right side of the spinal cord was of a decided grey colour, and the left side had a dull reddish-brown appearance. A little higher up, some sections presented on both sides the same dingy reddish-brown. In the cervical region, the appearance of the spinal marrow was normal. There was no recognisable alteration in the white substance or in the roots of the nerves. The cerebral pia mater was in a slight degree œdematous. Nothing particular was observed in the brain. In the sciatic nerves, between the filaments, there was a very small amount of sanguineous infiltration. After placing the spinal cord in a solution of bichromate of potash, the morbidly affected parts were still recognisable by their modified colour. The changes observed in these parts were quite irregular. Sometimes the white and grey substances were affected at the same place; and sometimes one or other had alone undergone any change. Softened spots of the size of a pin's head were visible in about a *centimètre* of the grey substance of the superior thoracic region. At every point where there was a change of colour, either in the white or grey substance, there was a very large accumulation of fatty granulations. The ganglionic cells of the grey substance were intact, so far as could be ascertained. Westphal gives the name of *disseminated myelitis* to the lesions of the spinal marrow now described, and to this myelitis he attributes the paralysis.

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[1] See p. 305 of this volume.

Cases are recorded in which very similar lesions have been found on dissection in cases of the paralysis of DIPHTHERIA. Oertel, in his work on Diphtheria, mentions a case, characterised by paralysis of both arms and both legs, in which the morbid appearances in the spinal cord appear to have been similar to those seen in the case described by Westphal, with this addition, that it was the site of numerous sanguineous exudations.

Dr. C. Morelli, in his essay on Diphtheritic Paralysis, as observed in Florence from 1861 to 1864, describes dissections in cases of paralysed diphtheritic patients in which analogous lesions were found in the spinal cord and nerves, and remarks :—"The anatomico-histological changes found after death are inadequate to explain the various forms of diphtheritic paresis and paralysis, and leave it an open question whether the pathogenesis of the affection be not entirely due to the morbific cause of the diphtheria, and whether the paralysis does not proceed from the peripheries to the nervous centres."

I see no reason to suppose that there is a specific morbid cause of paralysis in diphtheria. That the paralysis extends upwards, can hardly be doubted.

In a very small number of cases, permanence of diphtheritic paralysis depends on the supervention of a structural change in the tissue of the nerves themselves, or in the nervous centres by ascent of morbid influence from the periphery. Cases of this description generally go on from bad to worse, and do not admit of much amelioration by treatment. They are the exceptional cases, and however much value we may attach to Morelli's dissections it is not to them and the like that we are to look for *causes*.

Degeneration of muscular tissue is another, and a hopeless cause of permanence of the paralysis. This degeneration of tissue cannot be cured; but something may be done to prevent it, and arrest its progress by suitable alimentation and medical treatment. It is more apt to occur in certain muscles than in others. It has been and is frequently observed as a sequel of certain fevers, and of other diseases as well as of diphtheria.

When the paralytic affections of diphtheria have existed for a long time, there is great reason to fear that they have become permanent. In each individual case, however, it is the duty of the physician to search into the cause of the affection, and, even when the prognosis is as unfavorable as it is possible to be, resolutely and patiently to attempt a cure. In cases of diphtheritic paralysis apparently the most hopeless, recoveries occasionally take place. The physician, therefore, acting on rational principles, must try in succession different remedies, and even different methods of treatment, and never abandon the case as hopeless, till he has exhausted all his therapeutic resources.

It is encouraging to know that it is in accordance with general medical experience to state that even the *majority* of the cases of diphtheritic paralysis which, superficially looked at, seem hopeless, are really hopeful. A vigilant physician, fully understanding his therapeutic opportunities, and expert in adapting the details of treatment to the varying exigencies and difficulties of each case, generally succeeds in preventing muscular atrophy and permanent paralysis, its consequence.

The *minority* of unfavourable cases of diphtheritic paralysis embraces, among others, those in which the muscles of respiration are deeply involved. Within the last few years I have seen two seemingly convalescent cases in which death occurred from pulmonary congestion and apnœa consequent upon paralysis of the thoracic parietes. There is also a form of pseudo-bronchitis met with in the convalescence of diphtheria which in weak subjects, or when excessive in degree, is very dangerous. From paralysis of the muscular fibres of the tubes, the tubes get clogged with secretion—a state of pseudo-suffocative catarrh is produced. In such cases the treatment must be immediate and energetic. Vesication of the chest gave prompt relief in one very anxious case of this kind in which I employed it. The advantage gained by the blister was followed by stimulants and the *liquor strychniæ* and the Br. Ph. administered in doses of two drops, after food, three times in the twenty-four hours.

Sufficient evidence has been adduced of the important fact, that although paralytic affections are very much more common as sequels of diphtheria than of any other malady, they do occur in the course of, and after, all asthenic diseases, and also in diseases which are from any cause characterised by anæmia and exhaustion. In all such cases there exists a greater or less tendency to recovery—a greater or less struggle with imperfect nutrition and its cause. In all such cases, therefore, there likewise exists an imperative demand for that alimentation which, from easy assimilation and special recuperative qualities, will best restore the waste of tissues, make red blood, and re-establish the nervous influence necessary for the normal maintenance of the functions of the various organs of the body.

The pathogenesis of *most*—I do not say of *all*—of the paralytic affections following acute diseases is no doubt the same; and if so, their treatment must necessarily be also similar. In convalescence from these diseases, and indeed, it may be said, always in convalescence, the dominant condition is asthenia. It is the existence of asthenia and anæmia in convalescence which, as a rule, alone constitute the difference between it and health. It is to the dominance of asthenia and anæmia that the paralytic affections of convalescence are attributable, though their long continuance and permanence may be due to the development or supervention of other causes. During the course of, and in the convalescence from, no other disease, are asthenia and anæmia so constant and so profound as in diphtheria; and, consequently, in no other disease is paralysis so frequent. Dr. Bailly, in his inaugural thesis for the Parisian doctorate in 1872, entitled *Des Paralysies Consécutives à quelques Maladies Aigues*, has collected 220 cases of diphtheritic paralysis, and has not been able to find in the records of medical science more than 55 cases of paralysis following typhoid fever, and 24 following smallpox. He comes to the conclusion that in every 11 cases of diphtheria, one is characterised by paralysis. Trousseau, to whom French medicine is indebted for the complete and beneficial change which has taken place in the treatment of typhoid fever, attributes the frequency of nervous sequelæ in that disease to the atonic condition to which the convalescents were wont to be reduced by a long-continued and resolute antiphlogistic regimen.

This subject invites discussion, but not being fairly within the scope of the present paper, it must be dismissed by a bare statement of two or three facts :—1st, The paralytic affections of convalescence are generally (and I think correctly) regarded as originating in reflected peripheric irritation; 2nd, They generally begin in the inferior, and afterwards show themselves in the superior extremities; to this rule there are exceptions, and while they have their predilections, they are met with in all the muscles and muscular organs of the body; 3rd, In diphtheria alone, the paralysis has the distinctive character of showing itself first in the veil of the palate, beyond which in many cases it does not extend; 4th, Sudden death in diphtheritic paralysis frequently occurs from the paralysis attacking the heart, larynx, or muscles of respiration.

The principles applicable to the dietetic and medical treatment of the general disease are also applicable to its paralytic sequels. So-called specifics are valueless. The system must be nourished and tonified—the plan adopted being based on rational principles, and carefully modified in accordance with signs, symptoms, and results. Cod-liver oil, from its nature as well as from its easy assimilation, proves of signal benefit in arresting waste of tissue. Bordeaux wine is often at once food and physic in the paralysis of diphtheria; and in cases of flagging convalescence, it is of all wines the most recuperative, being alimentary and tonic, as well as stimulating. Sometimes it may be administered very largely; but Bordeaux, like other stimulants, must always be given with discretion and watchfulness. About the 5th March S. M. was, I believe, getting too large an allowance of wine.

Iron is particularly indicated in diphtheritic paralysis, as the patients are always anæmic. There are few cases in which its administration does not prove itself in an obvious manner to be useful in a high degree. Sometimes it is only borne in very small doses.

Nux vomica, either in the form of extract or the *liquor strychniæ* of the British Pharmacopœia, taken daily, with some ordinary combination of laxatives, such as the compound rhubarb pill of the British Pharmacopœia, ought to constitute a part of the treatment in nearly every case. It increases the peristaltic action of the intestine, imparts expulsive and retentive power to the bladder, and likewise has a general influence in improving innervation. The dose ought to be moderate, for large doses prove too exciting to the nervous system, and so tend to exhaust rather than invigorate its flagging powers. From half a grain to two grains of the extract once a day, with or without the occasional or constant addition of from five to ten drops of the *liquor strychniæ* two or three times a day, are suitable doses.

Local treatment is of the utmost importance. Its chief aim is to direct towards the wasted and wasting muscles a greater supply of blood, and thereby improve their nutrition. Occasional blisters act very beneficially in this way; but they must not be relied on to the exclusion of the constant use of stimulating pastes or liniments. I do not know of any local stimulants more efficacious or better adapted for continuous use, than a ginger and mustard paste like that employed in the case of S. M. The object of using the paste is to maintain a warm glow in the skin without vesicating it. The potency of the paste must therefore be proportioned to the susceptibility of the skin. By applying too powerful a stimulant to an extensive cutaneous surface, we may be obliged to suspend the local treatment, and so impede the progress of the cure. In some excitable patients who cannot bear long-continued counter-irritation of the skin, a gentle kneading of the paralysed muscles, three or four times in the twenty-four hours, will be found useful as a means of directing a supply of blood to them. In such cases, after each kneading, a moderately stimulating liniment containing a small quantity of laudanum may be applied with great benefit. The laudanum prevents an uneasy bruised feeling, which is often complained of after the kneading, and in irritable subjects is apt to induce restlessness and insomnia.

Galvanic excitement of contraction in the paralysed muscles is often decidedly useful; but it is a measure which requires to be employed with moderation and at intervals of about twenty-four hours. If resorted to too early, or too freely, it exhausts the nervous powers of the affected muscles.

The principles of the treatment of the paralytic affections of diphtheria are precise and simple; and yet there are few, if any, diseases which more severely tax the patience, ingenuity, and therapeutic resources of the physician. He has—as in every stage of diphtheria and its sequels—to devise and carry out innumerable little details which do not admit of description, and yet upon which success or failure may depend. He has also more frequently in this than in most diseases, difficulty in holding his own against the wishes of despairing affection, too eager to seek counsel from some special quack, or to try an infallible nostrum, which meddlesome ignorance has declared to have been successful in a "precisely similar case."

[The paralytic affections of HYSTERIA and the PUERPERAL STATE are reserved for discussion in separate papers to be afterwards published.]

VIII.

NON-VENEREAL DISCHARGES

FROM THE

GENITO-URINARY ORGANS OF BOTH SEXES.

[*Revised extract from a paper published in the Edinburgh Monthly Journal of Medical Science for September* 1844; *entitled* "*Observations on Gonorrhœa and Syphilis with reference to Forensic Medicine and Therapeutics.*"]

NON-VENEREAL DISCHARGES

FROM THE

GENITO-URINARY ORGANS.

THE medical practitioner is sometimes called upon, in circumstances of peculiar delicacy and responsibility, to pronounce opinions as to the venereal or non-venereal nature of various discharges from the genito-urinary organs. The following remarks bear on some of those classes of cases regarding which the physician is apt to be craved earnestly for prompt judgment.

The subject will be considered under the following heads :

I. Purulent Discharges from Genitals of Female Children.
II. Do. do. from Genitals of Female Adults.
III. Do. do. from Urethra of Male Children.
IV. Do. do. from Urethra of Male Adults.

I. PURULENT DISCHARGES FROM THE GENITALS OF FEMALE CHILDREN.

Discharges of a muco-purulent or catarrhal nature take place from the genital organs of persons of both sexes, and of all ages, independent of those of a similar appearance, the origin of which can be traced with probability to sexual intercourse. It is in children that they are most often met with; and it is in them also that we can most frequently establish with certainty their non-venereal origin.

They are more common in girls than in boys, a fact which is sufficiently explained by the greater extent of the mucous membrane of the female genital organs, and the less perfect manner in which nature has defended it from the external agency of foreign bodies, cold, and wet.

Cases of the nature at present referred to are more frequent in hospital and dispensary, than in private practice. This greater frequency might be expected, in the climate of North Britain as a natural result of the unrestrained and exposed manner in which the female children of the lower orders are allowed, in every state of the weather, to paddle and sprawl about in the filth and mud of the streets and surface street-drains. They *generally* proceed from the mucous membrane anterior to the hymen. When neglected they become chronic.

Two illustrations are subjoined of cold and damp producing these discharges as the result of vaginitis in an acute form.

CASE I.[1] *Urethritis and Vaginitis, from Exposure to Cold and Damp.*

A. B., a girl aged seven years, the child of respectable parents, after exposure to cold and damp, became affected with catarrh, and at the same time began to complain of a scalding pain during micturition. In two or three days afterwards, a thick, whitish, purulent fluid, was observed oozing in considerable quantity from between the labia. When I saw the patient, the discharge was of a greenish colour: there was considerable tumefaction, and great vascularity of the external parts of generation. Very careful inquiries were made as to whether the child could in any way have come in contact with gonorrhœal matter or whether there was any possibility of her having been abused by the other sex; but it clearly appeared, that she could not have been contaminated by these means. Owing to the acuteness of the inflammation, it was judged proper to apply leeches to the inside of the labia, which had a good effect; and she was ultimately completely cured by a sulphate of copper lotion and great attention to cleanliness.

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[1] This and the following case occurred in 1835, in the public practice

CASE 2.—*Urethritis and Vaginitis from Exposure to Cold and Damp.*

E. D., a girl two years old, was secluded in Bridewell, together with her mother, for about six weeks before she was taken ill. There was at first a good deal of *ardor urinæ*. When I saw her, the discharge was purulent, thick, and of a greenish-yellow tinge. From the state of separation in which Bridewell prisoners are kept, it is quite impossible that she could have come in contact with males, or with any person affected with gonorrhœa. The women among

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of Dr. James Simpson, who kindly took me to see them, knowing that I was then engaged in studying the subject which they illustrate.

whom she was placed were all found to be free from vaginal and other discharges.

In both these cases, there seems good reason to conclude that exposure to cold and damp was the cause of the catarrh and of the genital discharge, since they appeared simultaneously, and could not be traced, after the most minute investigation, to any other source. The second patient had a slight cough, and as she was very insufficiently protected from the cold and damp weather which then prevailed, we may explain the running in her case in the same way as in the other.

The following case illustrates another source of this disease, viz., infection with the matter of ophthalmia.

Case 3.—*Vaginitis in a girl of two years and a half, apparently caused by Contact with the Matter of Ophthalmia.*

Elizabeth J., a scrofulous child, aged two and a half years, from Cumberland Street, was admitted on the 27th March, 1844. She had then a very copious muco-purulent discharge from the inner surface of the vulva and vagina, a purulent discharge from both eyes, and an ulcer on the left cornea. There were scabs and pediculi on the head.

The child had been under treatment by one of the medical officers of the Eye Dispensary, for the eye affection, which had been improving somewhat. The vaginal discharge had not been treated. A servant girl of filthy habits, with whom the child slept, had a purulent discharge from the eyes, at the time the disease showed itself in the child, which was about six weeks before she went to the Dispensary.

The treatment prescribed consisted of cod-liver oil internally, an alum collyrium for the eyes, and a sulphate of zinc lotion for the genitals.

March 28.—A collyrium, containing one grain and a half of nitrate of silver dissolved in one fluid ounce of distilled water, was prescribed for the left eye. An ointment of induret of sulphur—one scruple to the ounce of lard—was ordered to be applied to the head once in twenty-four hours.

April 1.—She was much better in all respects. The nitrate of silver collyrium was discontinued. The ulcer of the cornea had cicatrized without leaving any speck.

April 3.—The discharge from the eyes had almost ceased. The vaginal discharge was less copious, and had lost its greenish hue. The head was free from scabs and pediculi.—The application of the ointment was discontinued.

April 9.—She was now well in every respect, except that a slight vaginal discharge remained. Instead of the sulphate of zinc vaginal injection one of sulphate of copper—two grains to the ounce of water—was ordered.

April 16.—There has been no vaginal discharge for two days. The eyes continue well. Dismissed cured.

After some months, there was a temporary return of the discharge from the genitals, consequent upon exposure to cold.

These purulent discharges frequently occur in scrofulous children from very slight causes; and sometimes also in others of a less irritable temperament, when suffering from teething, from intestinal worms, and after certain articles of food or medicine. This fact has been stated long ago by men of authority, such as Astley Cooper, Hamilton, and Underwood; and is familiar to all who have had experience in the diseases of children. Girls of from one to four or five years old (especially such as are tainted with scrofula) are often troubled with pain and itching in the genitals, proceeding commonly from intestinal irritation in connection with teething. Such cases, when neglected, often give rise to troublesome vaginal discharges. Careful and repeated ablution, a soothing liniment, with the occasional administration of grey powder and rhubarb, I have found to be a very effectual treatment.

Sir Astley Cooper, although he cautioned his students in the most energetic language against committing mistakes in this matter, described the non-venereal affection in words which correctly characterise a common clap. "When a child," says he, "has this discharge, there is a heat of the parts, slight inflammation, and this sometimes increases and goes on to ulceration."[1] Dr. Underwood states, that "when the discharge is much discoloured and fœtid, it gives rise to a suspicion which young practitioners cannot be too guarded against. There are, indeed, instances of little girls, not more than six years old, being injured, and it is therefore of consequence to make a judicious discrimination; but there are, on the other hand, instances of a very suspicious appearance, as late as the age of thirteen or fourteen, where no injury could be received without the consent of the party, who is generally perfectly innocent, and where, therefore, the least suspicion would be distressing to her, and might make a whole family miserable." And Dr. Underwood adds in a note,—"I have known the discharge to be so ill-coloured and fœtid, and attended not only with great pain, and inflammation, and excoriation in different parts, but with such tumours, and other appearances resembling violence offered about the furca, and in other instances, with an abscess in the labia, that had the patient herself advanced any charge, I fear I should not have hesitated to have joined in with it; and yet from the event, as well as from the whole history of several cases, it has been very evident that no kind of injury had been received, nor anything like intercourse taken place."[1]

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[1] Cooper (Astley):—Lectures on Surgery. 12mo. London, 1832. P. 502.

The frequency being so considerable of non-venereal discharges closely simulating in appearance those caused by sexual intercourse, it becomes a matter of importance for the practitioner to have his mind made up as to the best means to be adopted for forming a positive or probable differential diagnosis; and in particular, to be ready to say whether any physical signs exist by which the two discharges can be distinguished from one another.

Beck, although he mentions several cases in which the fate of the accused in a great measure depended upon the opinion of the medical witnesses as to the venereal or non-venereal character of the discharge, does not give any test by which the difference can be established. Ryan—whose statements on various subjects are often rash—insinuates, that those who cannot distinguish the discharges which are, from those which are not, the produce of impure coition, are ignorant practitioners; and he tells medical witnesses to distinguish between purulent discharge, the consequence of violence and inflammation, and that arising from infection. He does not, however, give a single rule to guide the practitioner in forming his diagnosis; but immediately adds:—"The history of the case will enable him to form a correct opinion in the majority of instances; and he ought to ascertain whether the child has been subject to this discharge previously to the offence." No one will deny that it is an imperative duty minutely to sift the history of the case; but then is it not for the sole purpose of throwing light on the history of a case that a medico-judicial opinion is required? In a case of alleged rape on a female child, for example, we are called on to make an examination, that we may give an opinion, so far as the circumstances warrant, with reference only to what we have seen; and probably the chief value of our evidence will be to correct and test the statements of other parties, who are supposed to be influenced by motives of hostility or compassion for the accused.

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[1] UNDERWOOD:—Diseases of Children. 8vo. London, 1819. Vol. ii, p. 123.

The following remarks of Mr. Carmichael, although generally correct, do not contain a safe rule of diagnosis, as is clearly shown by several of the cases detailed in this paper.—"The very circumstance" says this author "of discharge from the urethra affords one of the strongest diagnostic symptoms by which we are enabled to distinguish gonorrhœa from leucorrhœa, or other discharges to which the female parts of generation are subject. The other diagnostic signs are those of inflammation, *ardor urinæ*, and a greenish colour imparted to the linen of the patient by the gonorrhœal discharge—circumstances not attendant upon the complaints with which it is most liable to be confounded." P. 101.

Dr. Alfred Taylor's opinion on this point, as stated in the following sentences, is judicious:—"If the child be labouring under syphilis or gonorrhœa, this is positive evidence of impure intercourse, either with the ravisher, or some other person; but we should be well assured, before giving an opinion, that the discharge is of a gonorrhœal, and not simply of a common inflammatory character. The party accused might be at the time free from the disease; or if labouring under it, then we should expect that the discharge suddenly made its appearance in the child with the usual severe symptoms, at a certain interval of time after the presumed intercourse, *i. e.* about the third, fourth, or fifth day. When these conditions do not exist, *it is extremely difficult to form a medical opinion on the subject, since there are no means of distinguishing those sporadic discharges from those which are gonorrhœal. Under these circumstances proof must be derived from non-medical sources.*"[1]

II. PURULENT DISCHARGES FROM THE GENITALS OF FEMALE ADULTS.

It is well known that various causes besides impure coitus give rise to catarrhal affections of the vagina, and discharges simulating gonorrhœa; but yet it may be asked, are the majority of practitioners sufficiently guarded in giving their opinions in cases of this description, when the veracity of the patient is doubted?

The effect of exposure to cold upon the mucous membrane of the female genital organs was several times strikingly brought under my notice, when a pupil at the Lock Hospital of Edinburgh; and upon referring to my notes of the practice of that institution, I find the following very apposite illustration of the fact to which I have now referred.

CASE 4.—*Return of Vaginal Discharge from Exposure to Cold.*

Mary G., a woman of florid complexion, between 20 and 25 years of age, after being completely cured of gonorrhœa, was transferred from the Lock Hospital to the Magdalen Asylum. Though the discharge was completely stopped, the parts remained slightly more vascular than natural—a state in which they often continue for some weeks after the cessation of the running. For three weeks after admission into the asylum she was free from the complaint. At the end of this period, after being much exposed to cold in washing clothes, she was again seized with acute symptoms, and was in consequence sent back to the hospital. When examined on her return, she was found to be affected with symptoms similar to those which characterise a recent and severe gonorrhœa. I do not think it possible that she could have got any fresh venereal contamination, because the matron of the Lock accompanied her to the Asylum, so that the possibility of her being enticed back, even for a moment, to her old haunts of vice, might be prevented; and it need hardly be stated that, when once within the walls of the Magdalen Asylum, all chance of intercourse was at an end.

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[1] TAYLOR:—Medical Jurisprudence, p. 577. London, 1844.

Case 5.—*Acute Vaginitis from Exposure to Cold.*

A married lady, the mother of several children, convalescent from a severe illness, being fatigued, and perspiring from walking beyond her strength, sat down for half an hour to rest on a damp bank. Next morning she was unable to leave her bed, from feverishness, sore throat, and general pains, which were especially severe in the back and knee-joints. Together with these symptoms she had a feeling of fulness and discomfort in the vulva and vagina: and two days afterwards, when I saw her, she complained of swelling of the labia, profuse discharge, and scalding of the parts when the urine came in contact with them. The treatment consisted of low diet, antimonials, and fomentations for three or four days. After the acute symptoms subsided, an injection of the sulphate of zinc (gr. vj ad ℥j), was used. The cure was rapid.

The lady's imprudence mentioned at the commencement of this statement accounts for all the symptoms, including the vaginitis.

CASE 6.—*Vaginitis, with Symptoms Simulating those of Abortion, in a Virgin.*

Miss ——, an hysterical dyspeptic young lady, aged 20, suspected of masturbation, was placed under my charge some time ago. Among her other complaints, she had a swollen, inflamed, and irritable state of the labia, vagina, and os uteri, together with a considerable discharge. The freedom of access to, and wideness of, the vagina were remarkable for a virgin, and the patency of the os uteri was still more surprising, as the finger could easily be passed into the orifice. With the advice of Professor Simpson, leeches were applied to the uterus, and other local treatment was adopted in addition to the use of general tonics. The case was obstinate and complicated; and was considered remarkable, not only by myself, but also by Drs. Abercrombie and J. Y. Simpson, with whom I had several consultations. The patient at last recovered from all her ailments, when she married, and, within a year, became a mother.

The last case is of high importance in medical jurisprudence. The state of the vagina and os uteri was very similar to the condition which exists after abortion; and yet it is almost certain that no such event had taken place in this patient. One such case—however small may be the class to which it belongs—shows the extreme caution and deliberation with which every sign and symptom requires to be weighed before giving a judicial opinion founded upon an examination of the female genital organs. This patient was, I believe, a virgin; and yet how many physical indications were there to throw doubt upon this opinion!

A first pure sexual connection sometimes originates a troublesome vaginal discharge, differing only in its cause from that occasioned by an impure coitus. By the statement of this undeniable fact, the practitioner has often saved his patient much mental distress, and been the means of preserving domestic peace.

III. PURULENT DISCHARGES FROM THE URETHRA OF YOUNG BOYS.

Mr. Moss, a surgeon of Windsor, has mentioned several cases similar to those of female children already detailed; and together with these, he notices an instance in which a purulent discharge of non-venereal origin proceeded from the urethra of a boy. As the affection was observed in several members of the same family, it is probable that they were all of an irritable constitution.

CASE 7.—*Purulent Discharge from the Urethra of a Boy six years old.*

"I was requested," says Mr. Moss, "to see a little girl three years of age, residing in Eton, whom I found suffering under every symptom of gonorrhœa. She had swollen and inflamed labia, a thick purulent discharge from the vagina, and acute pain in passing the urine. On making inquiry, I ascertained that the eldest sister, who was eleven years old, had in the preceding June been affected in the same manner, and that the second sister (eight years old) had also a few weeks afterwards been precisely in the same state. The mother had neglected to obtain advice for them, as she fancied that the symptoms arose only from weakness; and the discharge had continued on them in a slight degree up to that time. Two days after this visit I was desired to look at the grandmother, a woman aged sixty-six years, living in the same house, who was afflicted with one of the most frightful attacks of purulent ophthalmia that I ever beheld. About three days afterwards the brother of the girls (aged six years) was affected with swelling and inflammation of the prepuce and glans penis, accompanied by a profuse discharge and pain in passing his urine, which symptoms continued to be very severe for some days. I had seen several cases of inflamed prepuce in children from what I conceived want of cleanliness, and I had seen five cases of gonorrhœa in little girls from the same cause—at least, I could trace the disease to no other; but I had never seen cases of so decidedly marked and infectious a nature as the present." Mr. Moss adds:—"there is no reason to believe that these children had been infected from any venereal source; but it is probable that gonorrhœa may be generated in the genitals of the human female without any intercourse of the sexes, and I believe without the communication of any specific virus."[1]

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[1] Lancet, Dec. 10, 1835, p. 443.

When I first published this paper, I had not met with cases of boys similarly affected to the boy described by Mr. Moss; but since that date—thirty-two years ago—many have come under my notice. In strumous male children, particularly during dentition, and when suffering from ascarides in the rectum, I often observe that there is a thin muco-purulent discharge, together with painful urethra, and swollen prepuce.

IV. PURULENT DISCHARGES FROM THE URETHRA IN MALE ADULTS.

Purulent discharges simulating gonorrhœa are more frequently met with in women and children than in male adults. It would not be difficult, however, to show, that many cases of urethritis of considerable acuteness arise in adult males, independently of sexual intercourse; and also, that those which do follow it are often not the product of any specific poison, but originate either in physical injury during coitus, or in this cause together with the then contact of acrid vaginal or uterine discharges.

CASE 8.—*Urethral Discharge from Connection with a Menstruous Woman.*

A gentleman who had had repeated claps, consulted me, and in doing so, expressed great surprise at having again got the disease, as he was convinced that the only person with whom he had had connection for nine or ten months previously, was uncontaminated. It was ascertained that she had neither any discharge from, nor even the slightest abrasion or vascularity of, the vagina or neighbouring parts. She was menstruating when my patient contracted the discharge consequent upon intercourse with her.

There can be no doubt, from facts such as this, and from others which have been mentioned to me by various medical friends, that intercourse with menstruous women, especially in hot climates, and with those of uncleanly habits, or in whom the discharge is acrid, may cause an affection in the male which the most discriminating and experienced cannot distinguish from what would be contracted from the common clap of the strumpet, or others. It was probably to prevent such occurrences that the purification of the Jewish women was enjoined by the Mosaic law.[1]

Benjamin Bell, in his treatise on the venereal disease, has a very valuable though short chapter upon non-venereal gonorrhœa, or what he terms "*gonorrhœa simplex.*" He mentions an instance in which a gentleman got a severe clap from his wife when she was affected with fluor albus. This individual had repeated returns of the discharge after having connection with his wife at times when she had this flux, and he was also afflicted in a similar way after exposure to cold and wet. Mr. Bell states that ditchers are very liable to urethral discharges, simulating those deemed venereal, and which cannot, by mere inspection, be distinguished from them. One of his patients, who was annually engaged in wild-duck shooting, had always on these occasions a discharge of matter from the urethra after his feet and legs had been immersed in water for several days.

I have treated several *gouty* male subjects for urethritis accompanied by muco-purulent urethral discharge, who have assured me that the malady could not be the result of impure intercourse. In at least some of these cas impossible for me to doubt the truthfulness of the statement.

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[1] Leviticus xv, 24.

I have also treated several *rheumatic* male subjects similarly affected in the urethra, who have denied the possibility of their having caught gonorrhœa by intercourse. It is, of course, impossible in any individual case to establish such a statement by actual proof; but, nevertheless, having met with a number of cases of urethral discharge in persons of rheumatic diathesis who had no reason to conceal the truth as to the immediate cause of their malady, I consider it reasonable to conclude that rheumatic subjects are liable to non-venereal muco-purulent discharges from the urethra when under the immediate influence of various exciting causes, in conjunction with, or unassociated with, ordinary rheumatic manifestations. Three years ago an English gentleman residing with his wife at an hotel in Paris, was suddenly seized with acute rheumatism in one knee, and two days afterwards—the knee still remaining swollen and painful—with intense pain and swelling of one testicle and the urethra. Micturition was intensely scalding, and there was an abundant muco-purulent discharge from the urethra. Becoming alarmed at his condition, he telegraphed to London for his ordinary medical attendant who obeyed his summons and was in Paris on the following day, when he placed his patient in my hands. For weeks he suffered severely from acute urethritis, inflammation of one testicle, and profuse running from the urethra, the articular affection increasing in severity when there was a subsidence of the urethral affection. There was always, in fact, an alternation of suffering in the kneee and the genitals.

After the acute stage, the malady became stationary, which led me to treat the case as one of chronic rheumatism with alcalies, iodide of potassium, iron, and quinine. Complete recovery was soon established. Eighteen months later, being seized with exactly the same symptoms, this patient came a long distance to Paris to be under my care. He recovered more rapidly than on the first occasion; but his illness was similar in all its features.

The manner in which gonorrhœa and rheumatism are frequently associated together has originated the term *gonorrhœal rheumatism*, which is an objectionable name as it suggests the idea that the specific disorder commonly called gonorrhœa is the essential cause of the rheumatism; whereas it is much more probable that it is only the immediate cause of determining a manifestation of the rheumatic diathesis. The concurrence of rheumatic affections of the joints with urethral discharges which are, as well as with those which are not the result of sexual infection, indicates that what has been called "gonorrhœal rheumatism" is really a diathesic and not a specific disorder. The subject is one which requires to be carefully studied in various fields of observation. The question is:—*What is the relation of gonorrhœal and other muco-purulent urethral and vaginal discharges to acute articular rheumatism?*

CONCLUSIONS.

The following are the most important practical conclusions to be deduced from the preceding cases and remarks:

1. That a variety of causes, constitutional and local, may (either singly or in conjunction with one another) give rise to discharges which cannot be distinguished from those occasioned by impure coitus to which the name of gonorrhœa is commonly applied.

2. That these affections ought to be treated as scrofulous, gouty, rheumatic, or simple inflammatory catarrhal affections of the genito-urinary mucous membrane—the diet, regimen, and medicinal substances known to prove constitutionally beneficial in each class of cases being chiefly relied on, together with mild local astringents or fomentations—according to the nature and stage of the case.

IX.

SCARLATINAL VAGINITIS

WITH

MUCO-PURULENT DISCHARGE.

[*London Medical Gazette*, *2nd August*, 1850.]

SCARLATINAL VAGINITIS.

In September, 1844, I published in the *Edinburgh Monthly Journal of Medical Science* a memoir entitled—"Gonorrhœa and Syphilis with reference to Forensic Medicine and Therapeutics"—in which I directed attention to various topics including non-venereal vaginitis. Since that period, several cases in my own practice, and others which have been mentioned to me by professional friends, have convinced me that exposure to cold, and other causes enumerated in the memoir referred to, are even more frequently the sources of inflammation and of purulent discharges from the vagina than I supposed at the period of its publication.

At present, I only wish to say a very few words with reference to a paper which appeared in the *London Medical Gazette* for 12th July, 1850, by Dr. Robert Barnes, entitled —"On the Occurrence of a Muco-Purulent Discharge from the Vagina in Scarlatina, and the Importance of this Symptom in Relation to Forensic Medicine." Dr. Barnes attaches a much greater amount of importance to such cases than I was aware they possessed. He considers them very uncommon; and in support of this opinion, he cites two eminent authorities, Dr. Tweedie and Dr. Miller. I do not write in a controversial spirit, but simply with the view of inducing others, to inquire for the future into the presence or absence of vaginitis in Scarlatina. Dr. Barnes says: "I am quite prepared to accede to the opinions of Dr. Tweedie and Dr. Miller, that a muco-purulent discharge from the vagina in scarlatina is a very rare occurrence; but this very circumstance increases the importance of the symptom in relation to questions of Forensic Medicine."

In 1857-58, during the last epidemic of scarlatina, I had, under favorable circumstances, a considerable though not a very large experience of the disease; and of all my cases I have preserved a record. Vaginitis I frequently met with; and I regarded it in no way as an unexpected or rare occurrence; but on the contrary as a not unlooked-for extension of the exanthematous inflammation of the skin, analogous in its nature to what is often met with in the mucous linings of the nose, ear, air-passages, and intestinal canal. In the epidemic of 1857-58, I had under my charge twenty-three female patients, all of whom were cleanly, well nursed, and in a respectable social position. In twelve of the whole number, there was well-marked vaginitis; and so impressed was I with the importance of attention in preventing this affection, that in every female patient, I from the very first directed careful ablutions of the parts to be performed at least twice in the twenty-four hours. Of the twenty-three female patients, two only were above fourteen years old, and these were respectively twenty and twenty-eight; they were both married. Both of them had *severe* vaginitis; the affection was much more severe in them than in any of the children. In one lady the discharge was so profuse for forty-eight hours as to require the nurse to change the towels at least every hour; and it was of so acrid a nature as to excoriate the thighs and anus.

notwithstanding every precaution to protect these parts. The other had it more mildly; but in her also the vaginitis was a source of great discomfort and suffering. The first lady aborted; the second was not in the family way. The first was the most dreadful case of scarlatina which I have ever seen issue in perfect recovery; the second was one of moderate severity. Both ladies suffered from intense articular rheumatic pains with swelling of nearly every joint great and small. Rheumatism was a characteristic of the epidemic of 1848—1849.

Speaking as I now do from a very limited number of facts, I must refrain from giving an absolute opinion as to the frequency or rarity of scarlatinal vaginitis; but I would venture to suggest that the non-observation of this affection by the practitioner is no proof of its absence; for patients suffering from scarlatina are often too ill to make complaints; and in other cases, the affection is managed by the nurse without her thinking it necessary to trouble the doctor. The question must be decided by future experience of a large number of cases carefully observed with a special view to its elucidation.

The only treatment generally required is frequent ablution with tepid water, and, if pain be complained of, the use of opiated fomentations. The children mentioned in in this paper, with one exception, required very little special treatment; but one of strumous habit continued to have a profuse muco-purulent discharge long after convalescence was in all other respects complete. Chalybeate medicines, cod-liver oil, and astringent lotions at last effected a cure. The two adults were both treated by mild injections of nitrate of silver, and by keeping the labia apart by a piece of lint soaked in the same solution.

In severe cases, the occasional application of a strong solution of the nitrate will be found one of the most useful remedies.

Since I published the above remarks in 1850, a period of twenty-six years has elapsed, during which I have seen a large number of cases of scarlatina in England and in France, but in only a very small proportion of them have I discovered vaginitis, though I have always inquired for it. The affection, therefore, is not common, which probably explains the correct statement made by the late Dr. Tanner, to the effect that—"most authorities omit all mention of it."

"Considering," says Dr. Tanner, "how extensively the various mucous tracts are affected in scarlatina, it seems strange that scarlatinal vaginitis is not of more common occurrence. In one case (a girl twelve years of age) about whom I was consulted, the nares, mouth and pharynx were also affected; but the vaginal inflammation was the most obstinate, and persisted for a long time after convalescence had been firmly established. A cure was effected by the adoption of the plan of treatment just advised for obstinate otorrhœa, together with the local use of astringents. Dr. Robert Barnes and Dr. J. R. Cormack have noticed the occasional occurrence of this form of vaginitis, though most authorities omit all mention of it."[1] The hopeful plan of treating otorrhœa recommended by Dr. Tanner consists in the use of astringent injections, flying blisters behind the ear, the administration of iron, cod-liver oil, and good nourishment, together with bracing sea-side air.

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[1] TANNER (T. H.):—Practice of Medicine, Vol. I, p. 293. London: 1869.

X.

CONGENITAL SYPHILIS.

[*Reprinted from Medical Times and Gazette of* 27*th February, and* 6*th March*, 1875.]

CONGENITAL SYPHILIS.

THE causes which determine the time and manner in which the congenite syphilitic poison first unequivocally shows itself—in the fœtus in utero or in the recently born infant—have not as yet been discovered. This statement is well illustrated by a case of twins mentioned by the late Dr. William Campbell, of Edinburgh. "The following case," he says, "would seem to prove that in a twin pregnancy the virus sometimes progresses very differently in each fœtus, though both are exposed to the same source of contamination. In the summer of 1823 a pupil of my class delivered a woman in Rose Street of twin males at the full time. The first was dead and much decomposed, while the second was living, plump, and apparently healthy. We were unable to account for this remarkable difference for some weeks, when the secret was revealed by the living infant exhibiting unequivocal evidences of syphilis; and shortly thereafter, the female parent also became affected with tertiary symptoms."[1]

It is a remarkable fact that although the syphilitic taint of the fœtus, derived from either parent, is a common cause of abortion, the vast majority of syphilitic infants are nevertheless born in a state of apparent health. For weeks they may appear to be thriving well, when all at once the dreadful malady declares itself by indubitable manifestations. My own practice has afforded me numerous proofs of the accuracy of this statement, which is now generally accepted as a clinical fact; and as such it has been more or less known to practitioners for fifty or sixty years.

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[1] CAMPBELL (William):—Illustrations of Congenite
Northern Journal of Medicine, vol. i, p. 8. Edinburgh, 1

In 1823 it was remarked by Cliet, in recording his experience of infantile disease in the wards devoted to foundlings at Lyons (to which from 16,000 to 17,000 children were then annually admitted) that syphilis "is one of the maladies which most commonly affect abandoned children, and is all the more appalling and dangerous that it exceedingly seldom shows itself at birth by evident signs."[1]

Cristofori, Physician to the Foundling Hospital at Bologna, announced in 1844 that he had arrived at similar conclusions from his own observation. He said that in whatever way syphilis is communicated to an infant, it generally manifests itself between the ages of one and three months—in very few individuals later; and in an exceedingly small number of cases at an age under one month. Never once, he states, was a newly-born infant admitted with the disease unquestionably developed.[2]

Abundant additional testimony to the same effect might easily be adduced, but this is not necessary, as most practitioners are now aware that it is unusual for syphilitic infants to bear the stamp of syphilis at birth.

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[1] CLIET:—Seconde Partie du Compte-Rendu Médico-Chirurgical des Observations Recueillées à l'Hôpital Général de la Charité de Lyon. Lyon, 1823.

[2] CRISTOFORI:—Gazetta Medica di Milano, 1844.

Trousseau believes that eight months sometimes elapse before the congenital disease manifests itself with certainty in the infant. In the last edition (1868) of his 'Lectures on Clinical Medicine' he says:—"In the infant, which in coming into the world bore no certain traces of venereal infection, pox rarely developes itself before the second week, and it is very exceptional for the disease to make its first appearance after the eighth month. Usually it appears about the fourteenth or fifteenth day after birth. These dates, which I gave so far back as 1847 in a memoir which I published conjointly with my friend Dr. Lasègue, have been confirmed by all subsequent observers, and are in harmony with those indicated by our predecessors, if we except cases of doubtful authenticity."[1]

On Friday, September 11, 1874, Mrs. B., an anæmic Englishwoman, brought her female infant to me at the ordinary consultations for out-patients given at the Hertford British Hospital. I had known a good deal about this woman and her family during both sieges of Paris in 1870 and 1871, when they were great sufferers from want of food and fuel, as well as from disease. Mr. and Mrs. B. passed then, as indeed they do now, as man and wife; but Mrs. B. is not the wife of B., with whom she has lived for the last eight or ten years, he having a living wife from whom he separated more than ten years ago. He is a German by birth, and earns a precarious subsistence by teaching languages. Mrs. B. teaches English, but only has occasional pupils. Privation, poverty, and disease are stamped on the countenances of both. I did not expect to meet with syphilis in the infant progeny of this couple. Till the occurrence of the case now about to be described, I had always looked on them as respectable married persons, valiantly struggling for daily bread.

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[1] Trousseau:—Lectures on Clinical Medicine, vol. iv, p. 331, of the English edition of the New Sydenham Society. London, 1871.

Mrs. B. states that at birth the patient, E. G. B., was perfectly free from eruption and snuffling, appearing, moreover, in all respects healthy, though of small size. She was born on June 26, 1874, so that when first presented to me at the hospital her age was three months less nine days. The small size of the infant confirmed the mother in her opinion that she had been confined a month before the natural term. On or about July 28—that is to say, fourteen or fifteen days before admission—without any previously recognisable impairment of health, the skin of the whole body became covered with a general redness, described by the mother as exactly similar to the eruption of scarlatina. In a few days the eruption became moist, and gradually lost its bright red colour. After this change had taken place in the aspect of the eruption, the skin became tense and leathery, looking as if deeply cracked in various places. Around the mouth and anus these appearances resembled cuts or hacks made with a knife. Some days before admission there were deep cracks between all the fingers and toes. The mother is positive that the right thumb has had three nails in succession, and that most of the nails of fingers and toes have been renewed once, at least, since birth. Large exfoliations of epidermis took place some days before admission from various parts of the body: those which came from the hands and feet bore a considerable resemblance to the tattered fragments of a glove.

The mother has a debilitated, cachectic appearance, and complains of having very little milk for the infant. She is free from eruption; and on examination I could detect no trace of any syphilitic affection in the organs of generation or elsewhere. She says she does not know of B. having had venereal disease in any form since the commencement of her cohabitation with him, and she has no suspicion of his having been affected with any disorder of a syphilitic character. She states that he has at present a skin disease, and is suffering so much from acute rheumatism as to be unable to leave home, otherwise she would ask him to attend at the hospital to be examined by me, in consequence of my having said that the disease of the infant was syphilis derived from one or other of the parents. She was attended in her confinement by a French midwife, whom she promises to request to call on me. The mother was accompanied by another female child, aged two years and a half, which (with a view to prevent conception) she suckled till eight months ago. Neither during the prolonged lactation nor since nine months prior to its commencement has she menstruated. Lactation so prolonged might fully account for the anæmic, cachectic condition of the mother, without a syphilitic cause. The little girl of two years and a half has no eruption, nor any appearance of unwholesomeness or bad health except conspicuous anæmia, imputed by the mother to imperfect alimentation.

Patient's State on Admission.—The respiration is oppressed, though less, the mother says, than yesterday and three previous days. There is much snuffling. The nostrils are lined, and nearly plugged up by a pseudo-membranous exudation; they yield a slight amount of thick sanguinolent mucosity. There is a somewhat similar, but slightly less consistent discharge from the eyelids. Aphthous vegetations cover the tongue and the interior of the mouth. The skin around the mouth, anus, and vulva has a dirty-brown leathery appearance, and is deeply cracked. The skin of the cheeks is cracked and puckered, and in colour resembles the lees of red wine. The hands and feet are covered with a thick, puckered, leathery envelope, which is evidently formed of exfoliated epidermis, and a subjacent exudative layer. Cracking and puckering result from the contraction of the layer of exudation. Between all the fingers and between all the toes, there are deep red fissures in the diseased skin. On the arms, legs, thighs, and lower part of the abdomen there are large shreds of exfoliation similar to that which has just been described; pieces varying in size and shape—several of which are about two inches square—are lying almost detached on the surface of the infant. No enlarged glands can be detected in the neck, axilla, or groin.

The infant sucks so feebly as to require to be fed with a spoon. It does not seem to be in pain, and is neither restless nor fretful. It has an almost narcotised appearance. According to the mother's report, the urine is exceedingly scanty, and the bowels are very constipated. On opening up the infant's napkin, I observed that it was not wet with urine, but was covered with an abundant yellow alvine discharge of normal appearance. The mother having had the nature of the case explained to her, expressed a strong desire to wean the infant, and leave it for treatment at the hospital. It was forthwith received. The natural character of the fæces is the only circumstance which justifies even a slight hope that recovery is possible.

The following *treatment* was ordered:

1. The aliment to consist of an abundant supply of the Swiss condensed milk diluted with seven parts of water.

2. To have a tepid bran-bath, the time in the bath to be three minutes. Another similar bath to be given at an interval of about twelve hours. After each bath the skin to be carefully dried by wrapping the entire body in an old very soft napkin; the ulcerated, cracked, and chapped surfaces to be afterwards gently syringed with tepid water, and then covered with a soft rag soaked in black wash.

3. To have the tongue, mouth, and nostrils kept clean and moist by the frequent application of the glycerine of borax.

4. To have an eighth of a grain of hydrargyrum cum cretâ every four hours until one grain and a half has been taken.

Saturday, *September* 12, 11 *a.m.*—The treatment ordered yesterday has been carried out, except that a less quantity of milk has been administered. There has been great fretfulness and crying. The countenance is less pinched, less like that of a narcotised infant, and less unpleasant. On both occasions when placed in the tepid bath the infant is reported to have ceased to cry, and to have seemed much soothed. The bowels have been moderately moved twice since admission; and the dejections are said to have been of a yellowish colour. There is no evidence of any urine having been passed since admission. Epidermic exfoliation is proceeding with extraordinary activity. Since admission two finger-nails have been cast, and likewise the skin of several fingers and toes in sheath-like shapes.

The treatment prescribed yesterday to be continued.

Sunday, *September* 13, 4 *p.m.*—The treatment, as directed, has been carried out. The infant is almost unable to swallow: a small quantity only of the milk can be got down. Since yesterday there has been only one scanty stool; it was of a greenish colour. There is no evidence of any urine having been passed. The infant is feebler than yesterday, but its appearance has not deteriorated. Being accompanied in my visit to the hospital this afternoon by my friends Dr. Robert Hunter Semple, of London, and Dr. Arthur Mitchell, of Edinburgh, I submitted the patient and the history of the case to their judgment. They agreed with me in regarding the case as one of constitutional congenital syphilis of typical character, likely to terminate fatally in a day or two.

The alimentation to be continued, the Swiss milk being mixed with beef-tea in place of water. The baths and grey powder to be discontinued.

Monday, September 4th, 10 *a.m.*—The infant has just died as I entered the ward. Since I saw it at 4 p.m. yesterday there had been another scanty greenish stool, but, so far as can be ascertained, not the smallest quantity of urine had been passed.

Autopsy.—(*Tuesday, September 15th*, 11 *a.m.*, being twenty-five hours after death).—In conducting the anatomical examination of the body I was assisted by Drs. Semple and Baillie Cormack. There was no trace of decomposition of any of the tissues. It is, however, noteworthy, that the places from which there had been much exfoliation of cuticle presented an aspect which may be called that of pseudo-putrescence. The weight of the body was two and a half kilogrammes, which is about five pounds six ounces English. On laying open the cavities of the chest and abdomen, as well as in examining other parts, it was found that the body was fairly well nourished and was naturally supplied with fat. The *encephalon* weighed 380 grammes; the only morbid appearance which it presented was a gummy exudation in patches under the pia mater. The cerebrum, cerebellum, and medulla oblongata were anæmic. The *spinal cord* was minutely examined, after having been carefully removed entire within its membranes; nothing morbid was detected. The *liver* weighed 181 grammes. On the surface of the right lobe there were some yellow patches, but on cutting into the right lobe very little evidence of disease was apparent. The left lobe was in a very different state. On its upper surface there was a yellowish sub-peritoneal deposit, which extended down into the substance of the organ. In the situations where this yellowish sub-peritoneal deposit was most abundant there were conspicuous patches of thickened peritoneum. Although the yellowish cacoplastic deposit was most conspicuous on the upper surface of the left lobe, it more or less pervaded the whole of that lobe. The *lungs* weighed sixty-seven grammes; both were emphysematous, except posteriorly, where they were to some extent engorged with blood. The *heart*—when emptied of the white, tough coagula which it contained—weighed twenty grammes. Its external surface was studded with small, white, slightly elevated patches. Under the endocardium, particularly at and near the valves, there was a considerable amount of greyish gummy deposit. The *kidneys* weighed thirty-two grammes, the weight of each being exactly sixteen grammes. The cortical substance was infiltrated by yellowish deposit similar in appearance to that observed in the liver; it dipped down into the tubular portion. Both kidneys were equally and profoundly involved in this morbid state.

Although the symptoms during life and the appearances on dissection unequivocally marked the case as a typical example of congenital constitutional syphilis, the origin of the disease required investigation. As the father of the infant did not come to me, as I had expected, I went to him. Some days after the death of the infant, I called at the residence of the parents. I repeated to the father the statement I had made to the mother, to the effect that the infant had died from congenital syphilis, and that I wished to discover the source of its infection. He saucily replied that he was "enough of a doctor" to know that I was entirely mistaken. The infant, he said, was healthy at birth, and had died from the mother's milk having yielded imperfect alimentation. He willingly allowed me to examine him. I found that he had ulcerative pharyngeal gummata, a profusion of copper-coloured blotches on both legs, and nodes accompanied by tenderness over the spines of the tibiæ. After I explained to him the significance of these phenomena, he considerably modified his denial of having had syphilis. He said that he must have had it without knowing the nature of his disease—a circumstance which he said arose from the reticence of his doctor. It was satisfactory to have been able to trace the poison from the infant to the father. The mother—who had no external manifestation of venereal disease—was evidently suffering from a cachectic condition, exhibiting itself in loss of appetite, sleeplessness, and progressive emaciation. This train of symptoms had set in shortly before delivery, which, as I have already mentioned, occurred a month before the natural term. The mother, in fact, had been contaminated by circulation in her system of the paternally poisoned fœtal blood.

In this case, from the extreme severity of the syphilitic explosion, the rapid evolution of the morbid changes, and the neglect of early treatment, it is probable that for some time before the infant was brought to the hospital no treatment could have availed. In such rapid and severe cases complete recoveries are rare; and when an apparent cure is accomplished, the ultimate issue is generally very unsatisfactory. It too often happens in such cases that the saved syphilitic infant either succumbs under the dangers normally incident to childhood and adolescence, or dies an early death from phthisis or some form of scrofula. Unless treatment is commenced before morbid structure-changes take place in the lungs, liver, and other organs, an absolute cure cannot be hoped for.

In other cases, however, in which the syphilitic explosion is more moderate, and the treatment is prompt, skilfully adapted, and vigilantly pursued, complete cures are obtained. In every case, a persistent mild mercurial treatment is essential, alternated or supplemented by the administration of small doses of a ferruginous phosphate of lime and cod-liver oil. The preparations of mercury which I generally employ in infantile syphilis are calomel and hydrargyrum cum cretâ. I prefer the former, not because I believe in its superiority, but because I have generally obtained excellent results from its use. It requires, as a rule, to be given together with creta preparata, to prevent its acting too much as a purgative or intestinal irritant. This was the practice successfully pursued by the late Dr. William Campbell, of Edinburgh. He was in the habit of commencing with doses of a quarter of a grain of calomel and two grains of creta preparata once daily for the first ten days. He afterwards progressively increased the calomel to a quarter of a grain twice each day. Of course, the age, strength, and general state of the patient must in each case determine the amount and frequency of the dose. An infant six weeks old will generally bear well Dr. William Campbell's doses. It sometimes happens that the infant's irritability of stomach is so great as hardly to bear any calomel. In such cases, one of two other simple plans may be tried—viz., the administration of minute doses of a solution of the bichloride of mercury, or swathing the thighs every alternate eight hours in flannel bands smeared with a mild mercurial ointment. I usually prescribe a solution of half a grain of the bichloride in three ounces of distilled water and one ounce of syrup. Of this solution from one to two teaspoonfuls may be taken every six, eight, or twelve hours, according to the patient and the symptoms. When mercurial swathing of the thighs is adopted, the proportion of mercury in the ointment ought to be moderate—say from one to four drachms of the unguentum hydrargyri of the British Pharmacopœia to an ounce of lard. Two or three drops of the British Pharmacopœia syrup of the iodide of iron in water, three times in the twenty-four hours, is an admirable sequel to, or occasional change from, the mercurial course, which ought to be continued, if possible, for a month; then intermitted for a week or two; and resumed, with occasional short breaks, up to the period of dentition. This is of the utmost importance, for relapses are common, and remissions, to the great detriment of the patient, are apt to be mistaken for cures. Rhubarb, with carbonate of soda, when the bowels are confined, will be found a suitable laxative. The preparation of sulphur called compound powder of liquorice in the Berlin Pharmacopœia is also an excellent medicine in such circumstances. When purging or tendency to diarrhœa exists, prepared chalk will generally be found an efficient remedy; but it may be necessary to combine that medicine in a fluid mixture with a very small quantity of the British Pharmacopœia extract of logwood. The calomel sometimes suddenly induces severe and rapidly exhausting catharsis, which has to be promptly checked.

Tepid ablutions and warm baths are very useful; but the latter require care and judgment, both in prescribing and administering, particularly when the patient is weak. Ulcerated surfaces, cracks, chaps, and cuticular exfoliations must be treated with soothing and healing topical applications. Black wash and the glycerine of borax are both very suitable. Sometimes in the same case, and at the same time, I employ both. The black wash suits best for healing ill-conditioned ulcerated surfaces, and the glycerine of borax is useful when the soothing and healing of angry sores and large denuded surfaces is demanded. The glycerine possesses the great advantage of keeping the skin in a moist state, and of so preventing painful cracks. The soft, spongy ulcerations often met with around the anus and near the vulva may be very efficiently dressed with the glycerine of borax, to which there has been added a small quantity of Morson's creasote. The proportions I prescribe are from ten to fifteen drops of creasote to an ounce of glycerine of borax.

Ought the lactation of syphilitic infants to be mammary or artificial? That is, but ought not to be, a vexed question. It is no doubt better for the infant, if strong enough to suck, to draw its nourishment from the breasts of a healthy woman; but is it justifiable to sacrifice a wholesome nurse to the chance of saving a syphilitic infant? Certainly not. The nurse who suckles a syphilitic infant incurs an enormous risk: many an unsuspecting woman has acquired syphilis from her nursling. Were the risk infinitely less than it is, I should still say that it is not right that it should be incurred, for, when well understood and carefully carried out, artificial lactation is an excellent substitute for the breast. This, however, is too large a subject for incidental discussion at the close of a paper already, perhaps, of more than sufficient length, though far too short for the satisfactory discussion of the topics which have been mooted.

I have here refrained from detailing any of the many cases of recovery, or of treatment more or less successful, which have occurred in my practice, for unless stated at great length they would be almost valueless to the reader in respect of diagnosis, which is the root of the matter. Trousseau correctly remarks that "in infantile syphilis the diagnosis can be established only by patient inquiry into minute circumstances, and in cases of this kind descriptions are good only when they are long."

XI.

CHRONIC POISONING BY CHLOROFORM:

ILLUSTRATED BY A CASE OF

RECOVERY FROM APPARENT DEATH INDUCED BY THE INHALATION OF CHLOROFORM: DESCRIBED TO SHOW THE THERAPEUTIC VALUE OF INVERSION OF THE BODY WHEN THERE IS SYNCOPE FROM CEREBRAL ANÆMIA.

[*This paper was read before the Section of Surgery of the British Medical Association at Norwich on Wednesday,* 12*th August*, 1874; *and was published in the British Medical Journal for* 22*nd August*, 1874.]

CHRONIC POISONING BY CHLOROFORM.

J. A., a lady's maid, aged 27, was admitted under my care, to the Hertford British Hospital on January 30th, 1874. She was very hysterical, weak, and anæmic. She had chronic disease of the hip-joint and necrosis of the femur. On the day of admission, a small piece of dead bone was removed. On February 25th, deep incisions were made, and drainage-tubes introduced. These measures were resorted to in consequence of intense pain in the hip, thigh, and leg, tumefaction and tension of the whole right gluteal region, and the supposed existence of deep-seated matter under the gluteal fascia. From its being necessary to place the patient almost on her face, I operated without putting her under the influence of chloroform. The operation occasioned great pain, which lasted for some hours, though opiates were freely administered, and large warm poultices were applied to the hip and thigh. During the evening, she had two hysterical attacks, characterised by excitement and weeping. From that date, to May 25th, the patient's general state improved very much. The discharge by the tubes was at times profuse, and at times moderate. The internal medication consisted chiefly in the use of the syrup of the lacto-phosphate of lime and iron, and short occasional courses of the *B. Ph.* compound tincture of cinchona and the *B. Ph.* compound tincture of valerian. She had a liberal diet, including meat and wine.

On May 25th, I resolved to put the patient under the influence of chloroform, so as to be able to make, without torturing her, a thorough exploration, and to remove a loose piece of bone which could be felt by the probe. At 10.30 A.M. on that day, all was ready for the operation. The patient was placed on her left side, recumbent, and with the face quite free. The day was hot, but a light breeze was playing. The patient lay before, and within three feet of, a large casement window, which could, if a stream of fresh air were required, be thrown wide open in an instant. The necessary instruments and appliances for the operation, and for the possible emergencies of chloroformisation, were ready; and all arrangements were completed, without alarming or exciting the patient. I spoke some cheerful words to her, to which she pleasantly responded, expressing great thankfulness that she was to be allowed to inhale chloroform. I looked at my watch, and, calculating that ten or fifteen minutes would elapse before she was ready for the knife, I asked Mr. Vines (then our clinical assistant) to begin the administration, and to proceed slowly in our usual way. This he at once did, by placing near the patient's mouth a napkin folded as a hollow cone, and having within it a small quantity of chloroform. There was a free space of some inches between the towel and the lips of the patient. Within about two minutes, during which I had my watch under my eye, and my hand *on the* pulse, the patient had passed into a calm sleep, without having spoken a word, moved a limb, or twitched a feature. I pinched the skin of the forearm, which caused her to move the arm a little, but did not occasion any other manifestation on her part. The inhalation of chloroform was now nearly suspended; that is to say, the napkin was so far removed from the mouth, that the inhaled chloroform vapour must have been so diluted with atmospheric air, as to augment but slightly the existing anæsthesia. I kept my hand on the patient's pulse for two minutes more; she was then profoundly chloroformed, being quite insensible to pinching. The breathing was natural: the pulse, though slow, was quite regular, and of fair strength. At this moment, that is to say, at the end of four minutes from the commencement of the inhalation of chloroform, my colleague Dr. Herbert joined me. Just as he entered, I made a free incision, saying almost simultaneously to Dr. Herbert, "I think she is too much under the influence of chloroform." Glancing at her, and feeling her pulse, he replied: "Yes; but the pulse and breathing are all right." No more chloroform was given. Whilst I proceeded with the operation to its completion, the window was thrown open, and Dr. Herbert tried to bring back the patient to consciousness by flapping her face and chest with a wet towel, and speaking to her. This state of matters continued for about ten minutes; during that period, not the slightest signs of consciousness were shown. I had just completed the operation, when Dr. Herbert announced an alarming irregularity and sinking of the pulse. This occurred about twenty minutes from the time at which the administration of the chloroform was commenced. At this crisis, and throughout the whole duration of the unconsciousness, except once for a few minutes, the lips were red, and the face had neither a ghastly nor a pale aspect. This we all remarked, and spoke of at the time. The pulse became more and more irregular and feeble; and death seemed imminent. On the proposal of Dr. Herbert, the body of the patient was inverted; that is to say, the heels were held upright and the head downwards.

This proceeding is sometimes called Nélaton's method. It has been very well described and explained by Dr. Charles Campbell of Paris, in a pamphlet published in Paris during this year, entitled: *Etude sur la Tolérance Anesthésique Obstétricale.* At p. 34 of that pamphlet, a case is given of a woman supposed to have been saved by complete and long-continued inversion. This case occurred on Nov. 19th, 1861. Dr. Marion Sims was operating for vesico-vaginal fistula. MM. Nélaton, Beylard, Johnston, and Alan Herbert, were present.

A very striking improvement in the pulse immediately followed the inversion of my patient. She was maintained in the inverted position for about four or five minutes; the pulse had then so much improved, that we hoped the danger was past. Accordingly, we replaced the woman in the horizontal position, applying at the same time turpentine stupes to the legs, and injecting into the bowel an ounce of brandy beat up with an egg and a small quantity of beef-tea. This injection was retained. The amelioration brought about by the inversion continued, and seemed even to be increasing for five or ten minutes, when it began to diminish gradually, notwithstanding the diligent use of various resuscitory measures, such as placing mustard poultices in various parts of the body in succession, the application of ammonia to the nostrils and tickling them with a feather. More than once, Dr. Herbert passed his finger into the back of the throat, with a view to draw forward the glottis, should that have been necessary. Just before the inversion of the patient, I transfixed her tongue with a threaded needle, which enabled us, during the whole of the subsequent treatment, to keep the tongue out of the mouth, and the mouth open. Matters became rapidly worse: again, death seemed to be imminent. We repeated the inversion: it immediately produced an equally favourable result as on its first trial. Indeed, the second yielded even more conspicuously beneficial results than the first trial; and for this reason, that the condition of the patient was worse immediately before the second than immediately before the first inversion. Immediately before the second inversion, the irregularity and sinking of the pulse had been succeeded by a great diminution in the frequency and force of the respiration: prior to the first inversion, it was very much less affected.

The second inversion, like the first, was continued for four or five minutes. The patient was then replaced in the horizontal position, and the legs were treated as before with turpentine stupes. A turpentine enema was administered: it was retained. The face was, at short intervals, sprinkled with water refrigerated by ice. This was being done about twelve o'clock, when she opened her hitherto closed eyes and looked at those around her with a stupid bewildered gaze. When asked, whether she felt any pain, she answered "Yes," with a feeble but distinct voice. When I asked her, where she felt pain, she looked at me steadily, pointed to her chest, and pronounced the word "Weight." At this time she could not be induced to answer any other questions; she did not say one word in reply to many questions addressed to her; but when spoken to, stared at the person who spoke. For a little time, she decidedly improved. When irritants were applied, the pulse would rise and temporarily become firm and almost full. At half past twelve, she answered several questions, the substance of her replies being to the effect that she was dying, and was suffering less from pain than from a great weight at the chest. She recognised me and one of the nurses, addressing us by our names. She stared at Dr. Herbert, Mr. Vines, and others present with whom she was well acquainted, when she was asked to name them; and said "I know none of them." This return of comparative well-being and consciousness lasted for a very short time. Dr. Herbert had left me to attend to the out-patients, as we both believed that all was now likely to go on well. I immediately recalled him in consequence of a relapse. She suddenly relapsed into unconsciousness, the pulse fluttered and fell, and the breathing became very weak, very slow, and occasionally jerking. At the same time, and for the first time since the terrible scene began, her lips and cheeks became deadly pale; for several minutes she seemed on the very verge of death, and for some minutes she seemed to be dead, so long an interval occurred between her inspirations. Artificial respiration was employed by means of abdominal compression and movement of the arms. Under this treatment, the pulse (which had become imperceptible) returned; but for at least half-an-hour, whenever the artificial respiration was relinquished, the breathing showed an alarming tendency to fail. At this time, the danger seemed even more urgent than it had yet been; for never yet had the respiratory function been so seriously endangered. Without much hope of permanent benefit, she was inverted; and again with the happiest results. A little later, vomiting came on, which was very difficult; but it helped much to bring back consciousness.

At half-past one o'clock, Dr. Herbert and I arranged that I might then leave, as I was required elsewhere; and that I should return at four o'clock, he remaining, if necessary, till my return. I came back at four; and found Mr. Vines alone in charge, Dr. Herbert having left at half-past three, there having been a great amelioration in the symptoms. After I left, however, for nearly an hour, there had been several considerable relapses. The irregularity and sinking of the pulse were on one of those occasions so great and sudden as to occasion, for a few minutes, some dread of a fatal issue. At four o'clock, I found the patient in a curious state of drowsy semi-consciousness. She evidently did not know where she was, or who the persons were by whom she was surrounded. Her lips were red, and her pulse and breathing almost normal. Slight partial relapses of irregularity and weakness of pulse recurred whilst I remained at the hospital, from 4 to 6 P.M. During that time, the patient took some beef-tea, swallowing easily.

At 10 P.M., Mr. Vines sent me a good account of the patient, so that I did not return to see her till nine next morning, when Dr. Herbert and I saw her together. She was then heavy and drowsy, yet quite able to answer questions collectedly, though not always correctly, nor according to her usual modes of expression. When asked how she felt, she said that she had no headache, but pain and a sense of great weight in the region of the heart. Her chief complaint was of a distressing pain in the muscles of the shoulders and arms—the result, no doubt, of the movements we had made in employing artificial respiration. She said nothing of feeling pain in the seat of the operation or in neighbouring parts. Putting her hand to her tongue, where I had transfixed it with the needle, she said, "there is something wrong with my tongue." Next day, she was still in a state of semi-consciousness. This state went on gradually diminishing in intensity; but three days and three nights had elapsed before it had entirely passed away. At the end of that period, she had resumed her former ways in respect of food, sleep, and intelligence.

The *chronic* and the *cataleptiform* character of this case of poisoning by chloroform inhalation constitute two of its most remarkable features. Several cases of a somewhat similar character have been described by British and foreign authors. My case tends to confirm the statement of Berend, Casper, and others, that chloroform inhalations may prove fatal after the lapse of many days. After giving an analysis of cases, Casper says: "It can no longer be doubted that there is such a thing as chronic poisoning by chloroform; that is, that the drug, when it does kill, does not always kill instantaneously, but that hours, days, or even weeks, may elapse during which the person anæsthetised remains continuously under the influence of the poison, to which he at length succumbs. This doctrine is evidently of medico-legal importance."[1] One of Casper's cases relates to a woman who "was chloroformed on the 14th of December, previous to the amputation of her left leg, on account of a comminuted fracture, and who, up to the hour of her death, on the 23rd of the same month, had never completely recovered her senses, lost during the inhalation."

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[1] CASPER (J. L.):—Handbook of the Practice of Forensic Medicine. Translation of the New Sydenham Society, by Dr. G. W. Balfour. *London*: 1862.—See page 296 of vol. ii.

As I stated at the commencement of the narrative which I have now read, my patient was a weak, anæmic and hysterical woman.

In such a patient as J. A., it may be truly said, that other causes besides the inhalation of chloroform might, and often do, induce a cataleptic state. But it is also true that in her case, together with the catalepsy, there was in operation an influence due to the anæsthetic vapour. Minutely and well-observed cases of a similar character require to be collected and collated. As yet, comparatively few have been published; from which it may be concluded, that comparatively few have occurred. I have fully and faithfully recorded all that was seen and done in the case which occurred on May 25th, 1874, at the Hertford British Hospital, so that my report may contribute to the elucidation of the subject of chronic chloroform-poisoning at any future time, and by any future truth-seeking inquirer.

One of my principal objects in bringing this case before the British Medical Association, is to set forth facts which show, or seem to show, the therapeutic value of inverting the body when there is syncope from cerebral anæmia. Dr. Herbert, Mr. Vines, and I, were all, at the time, convinced that the inversion produced a powerful effect in restoring the contractions of the heart. I feel certain that the practice proved decidedly beneficial in our hands; and that it is a practice which ought to be resorted to in similar cases. I am, however, also convinced that *all the various restorative measures which we employed contributed to bring about recovery.* It is impossible to apportion the share of good which was accomplished by each of the means employed. No one can say how far the inversion of the body was the means of restoring life, seeing that artificial respiration was employed—the most wonderful agency in producing resuscitation of the apparently dead. Numerous cases are recorded in which, by means of keeping the patients warm and in the horizontal position, artificial respiration has saved them. Nevertheless, my case showed that, while artificial respiration was of signal benefit when the body was horizontal, inversion for four or five minutes—at intervals—was a useful addition to ordinary resuscitative measures. In the case so graphically described by my friend Dr. Charles Campbell, the duration of inversion was fifteen minutes—a period, I think, unnecessarily, and perhaps even dangerously, long. We all know the benefit of the horizontal position in cases of ordinary fainting. I am far from recommending that, in cases of chloroform-fainting, the inverted position ought to be preferred to the horizontal. I only recommend it to be used, as in the case I have described, for short periods—say for four or five minutes or less—at intervals—and in conjunction with the persevering use of artificial breathing, and the other common measures of recovery and precaution.

POSTSCRIPT.

I have received the following interesting and valuable letter from my friend Dr. B. W. Richardson. It is published with his permission.

London, August, 1874.

MY DEAR CORMACK,—I have read with deep interest your paper on Chronic Poisoning by Chloroform; and I have also read the case so graphically described in Dr. Campbell's French pamphlet, which you were so kind as to send to me.

Your case is very rare, but not altogether unique. In one case where Snow administered chloroform to a young woman in King's College Hospital (see my edition of Snow *On Chloroform*, p. 105), the patient remained unconscious for three days, but recovered without ill effects. In another case, a medical man administered chloroform to a young woman in domestic service (see the same work, pp. 105-6) for the extraction of a tooth. In a few minutes, she burst out into a fit of laughter, and then subsided into unconsciousness. Various measures, including artificial respiration, were used to restore her, from the impression that she was still under the influence of chloroform. Thirty-six hours after the inhalation, Snow was sent for. He found the patient apparently in a profound state of insensibility, and breathing very feebly. Some valerian was, after a time, administered to this patient, and in a few hours the unconsciousness passed away.

I attended a case myself in which similar symptoms followed upon the inhalation, not of chloroform, but of nitrous oxide gas. The gas was administered to this patient, a woman in the prime of life, in order to allow a tooth to be extracted. As sometimes happens from the gas, there was acute and severe convulsive movement during the narcotism, and the woman recovered imperfectly. She succeeded, nevertheless, in going some four hundred yards to reach the Metropolitan underground line, and got into a railway-carriage. Soon afterwards, while travelling, she fell back into unconsciousness, with faintness, extreme pallor, and active convulsion. At first, it was feared that she would die; but she was taken to her home, where she was put to bed semi-conscious. The following day, I was summoned to see her. She was still nearly unconscious, and the most I could get her to do was to put out her tongue. Her eye was not sensible when touched, and her pupils were widely dilated. Her pulse was irregular and weak, and her breathing very feeble. I learned that she had been in this state for twenty-four hours, but that at times she was intensely convulsed. I noticed also a fœtor of a most peculiar kind from the breath—a fœtor due to some substance having the odour of the organic sulphur compound called sulphur-alcohol or mercaptan. She had vomited several times, and had taken no food. These symptoms being looked upon as hysterical, leaning towards catalepsy, she was treated as for hysteria. It was six days before the symptoms abated, and at intervals there were recurrent attacks of convulsion. The symptoms throughout caused much anxiety, and recovery was not perfect for many weeks.

Nature of these Cases.—I agree with you distinctly that these cases are all types of hysteria, in what may be called the cataleptic phase of the hysteric disease. As yet, they have only been known to occur in the female subject. I do not think it correct to maintain that the persistent unconsciousness is due to the continued action of the narcotic agent administered to produce anæsthesia. There is no evidence to show that chloroform remains in the body even an hour after its administration has ceased; and in the cases I have related, in which nitrous oxide gas was used, it cannot be presumed for a moment that the gas was held within the organism, and was sustaining the unconsciousness for several days. The view I would myself offer is one which I ventured to submit in my report[1] to the British Association for the Advancement of Science at the Birmingham meeting in 1865; viz., that, during certain hysteric states, there is *formed* in the animal body itself an organic compound which like certain of the amyl and sulphur compounds, produces after the manner of a poison, the cataleptic condition. If this be true, it is easily understood how the administration of a volatile narcotic may give a start to the action of the narcotic product already present in the body, and that the effect may be sustained until the producing agent is eliminated by the excretions.

The particular Mode of Treatment by Inversion of the Body.—The mode of treatment followed out in your case recalls to my mind certain experiments—some of which you saw me perform in 1854—and which are published in the ASSOCIATION MEDICAL JOURNAL, of August 18th, of that year. Those experiments, as you will remember, were conducted in order to ascertain the effect of posture of the body on the action of the heart after anæsthesia and loss of blood. I had observed that, when the butcher is killing a calf, the action of the heart of the animal is systematically maintained by him, though hæmorrhage is still going on, by the process of suspending the animal for a time with its head downwards, afterwards laying it horizontally, and again suspending it until the body is completely emptied of blood. The fact led me to experiment, in order to learn the effect on the heart of different positions of the body. The details of the experiments will be found in the number of the ASSOCIATION JOURNAL above referred to, on pages 734 and 5; but the gist of them is, that the animals having been made to sleep, by inhalation of the smoke of the lycoperdon giganteum, until respiration had ceased, artificial respiration was established, the thorax was laid open, and the effect of position on the blood within the heart was carefully observed. It was thus found that, when the body had been suspended with the head upwards, until the auricle and ventricle of the right side had ceased to act from deficiency of blood in them, these parts could at once be refilled by the simple plan of laying down the body horizontally; that the right heart, so refilled, would recommence to contract vigorously; that if, at the same time, artificial respiration were sustained, the blood would make the pulmonic circuit, and that the left side would also recommence to act on receiving a new supply of blood from the lungs. These experiments bear immediately upon the point of practice followed in your case, and in that of Dr. Campbell. They show that if, by the simple plan of inversion, combined with artificial respiration, a current of blood could be induced to move over the pulmonic circuit, recovery in many otherwise hopeless cases would be accomplished. This is a fact I have long urged, especially before the London Meeting of the Association in 1862; and I have made many attempts to render the plan practicable, by what I have called *artificial circulation*. I have introduced a silver tube, attached to a small pump, into the right ventricle, and have tried to pump up blood from the cavæ, and force it, by a back stroke, over the lungs. I have also tried to draw the blood over the lung into the arterial channels by aspiration, but I could never succeed in so simplifying either of these methods as to render them practical. The question, therefore, arises: Will the simple method you describe meet the difficulty?

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[1] Report on the Physiological Action of the Amyl Compounds:—*Transactions* of the British Association for 1865. See pp. 272-280.

To try to solve this question, I performed yesterday the following experiment. A large strong rabbit was put to sleep with chloroform, and the administration was continued until the animal had ceased to breathe. Tracheotomy was immediately performed: a tube connected with the double acting bellows was inserted into the trachea, and artificial respiration was set up. At the same time, the animal was suspended by its hind legs, with the head downwards. The artificial respiration was steadily carried out, in the most systematic manner, for fifteen minutes, but there was no sign of restoration of the circulation. The animal being still suspended, I next laid open the thorax, and exposed the lungs and heart. The lungs were discovered to be responding perfectly to the action of the double bellows; but all parts of the heart were at rest, except the left auricle: this, charged with red arterial blood, was contracting; the other parts were so dead that they failed to respond to the intermittent galvanic current, although to the same current all the voluntary muscles responded vigorously, and continued to do so for an hour. I observed that the right cavities of the heart, the auricle, and ventricle, were tense with blood. I therefore let the animal down to the horizontal position; and when by this means the pressure of the blood was relieved, the auricle, and afterwards the ventricle, made a few feeble contractions under stimulation. No sufficient force was, however, exerted by the heart to make the blood traverse the pulmonic circuit; and, I may say, there was not at any time an indication of recovery.

How far the effect of inverting the body was useful in the two cases you have named, it is difficult to say, because in both artificial respiration was employed, and this in itself is so remarkable a means of restoration, that the effects of it have to be seen to be realised. By artificial respiration, I have resuscitated an animal *seven minutes* after its respiration had been stopped by the inhalation of chloroform; and there are cases in the human subject in which, after complete failure of the respiratory power from chloroform, artificial respiration has restored life, the body being retained in the horizontal position. It would be good practice, nevertheless, after the experience of the cases you have related, to add inversion or partial inversion of the body to the process of artificial respiration. The inversion should not be long sustained; if it be, the heart might be paralysed on its right side from the pressure of the blood, but it should be alternated by return to the horizontal line, the artificial breathing being zealously sustained during the whole time.

In certain cases, where the right heart is demanding the stimulus of blood to enable it to contract with effect, the required supply of blood may thus be obtained from the veins below the heart, and the pulmonic circulation may be restored—a result, if it be instantly resorted to, that will almost of a certainty render artificial respiration successful in restoring life when a volatile narcotic has caused the catastrophe.

I remain, dear Cormack, faithfully yours,

To B. W. RICHARDSON.
Sir John Rose Cormack, M.D.

XII.

SUCCESSFUL RESECTION
OF THE
SHOULDER-JOINT
IN A
CASE OF GUN-SHOT WOUND.

[*This paper was read before the Section of Surgery of the British Medical Association at Norwich, on Wednesday, 12th August*, 1874; *and was published in the British Medical Journal for 5th September*, 1874.]

RESECTION OF SHOULDER-JOINT IN A CASE OF GUN-SHOT WOUND.

Between six and seven o'clock on the evening of April 12th, 1871, when reposing at home after a long and anxious day's work among my wounded, I was summoned to the Ambulance Anglaise to receive four soldiers of the Commune, who had been wounded an hour or two previously at the bridge of Neuilly. Within two minutes, I was beside my new patients; for the Ambulance Anglaise (entirely maintained by Sir Richard Wallace) was installed in a spacious mansion and garden close to my house. One of the new comers was Alphonse Brunet, a strong muscular man of communistic type, thirty-four years of age. By trade, he was a mason. The exigencies of the Franco-German war had made him a soldier; and the civil war had more recently made him one of the pseudo-military masters of Paris.

On my arrival, I found him yelling lustily, and evidently suffering intense pain. Experience justified me in attributing his noisy violence more to alcoholic preparation for fighting, than to the wound which he had just received. Like many of our wounded of the second siege, he came to us in an almost frenzied state, the result of alcoholic excesses, bodily pain, and a peculiar form of mental excitement engendered by the desperate game which all knew had to be played out to a terrible end. It was not without difficulty that Brunet was undressed and put to bed. He had to be held down by infirmary men, whilst I examined his wound. The whole hospital was disturbed by his noise and cries.

I found that a rifle-bullet had entered from behind, at the top of the right shoulder, and had made its exit in the anterior aspect of the upper third of the arm, smashing in its passage the head of the humerus and the upper part of its shaft. This information was at once obtained by introducing the little finger into the wound. In very recent gun-shot wounds, although the hole made by a Chassepot bullet is small, finger exploration can often be made either with or without enlarging the wound. There is no probe equal to the finger, when the wound admits of its being used.

The patient at once consented to amputation, or any other operation which I might deem necessary, provided it relieved him from pain. Lack of daylight, and my own state of fatigue constrained me to postpone the operation till the morning. At that period, moreover, I had to perform operations under great difficulties. I could only command one assistant possessing any professional training—my son, Mr. J. R. Baillie Cormack, who during the German siege had served in the American Ambulance, till it was closed on March 1st, when he came to the Ambulance Anglaise.

I left the patient (about eight P.M.) having administered to him a grain of opium, and directed another grain to be given at midnight should he then be noisy or sleepless. It was found necessary to give the second grain at midnight. At the commencement of my visit at seven next morning, I saw the patient. He was tolerably calm. He was reported to have slept very little, if at all, during the night. He complained of intense pain in the shoulder and arm; and objected to the slightest examination of the wound being made till he should be put under the influence of chloroform. I agreed to act in accordance with this wish. At nine o'clock, on a beautiful sunshiny morning, the patient was carried from his bed to an adjoining room, and placed in an easy position on the operating table in front of two large windows. My friend, and near neighbour, Mr. Falconer Atlee, Her British Majesty's Consul, kindly responded to my appeal, and came to aid us as he had before done in similar circumstances. Taking a deep interest in surgical proceedings, and doing exactly what he was appointed to do, he made a most efficient and reliable assistant in such emergencies. As the operation was likely to be of long duration, and as the patient was already considerably narcotised by opium, as his contracted pupils showed, I directed my son to give the chloroform very cautiously and slowly, which he did by placing near the patient's mouth a napkin folded as a hollow cone containing within it a small quantity of chloroform. The time occupied in bringing the patient fully under the influence of the vapour was twenty minutes. He gently passed into complete anæsthesia, after a short stage of subdued talkative delirium. Mr. Atlee then took charge of the chloroform, allowing the vapour to be inhaled at such intervals, and to such an extent, as was sufficient to keep up, without dangerously increasing, the narcosis. At the first plunge of the knife, the patient moaned slightly; but afterwards during the operation, which lasted forty-five minutes, he remained quiet and motionless, with normal pulse and respiration. He was not at all roused by removal from the operation-table; and remained in a profound sleep for half an hour after he was replaced in bed. On awaking, he was quite free from pain, and spoke to me very pleasantly, expressing satisfaction that his arm had not been amputated. He did not seem to be the same man who had been so unruly and noisy on the previous night.

In severe gun-shot wounds, it is of immense importance to bring the patients, with the least possible delay, under the obtunding influence of opium; and, sometimes, to maintain them for days under that influence. It is, of all the drowsy drugs, the most valuable in such cases. To use it skilfully, cautiously, and very watchfully, is often to secure recovery from the most terrible mutilations of war—provided there be a possibility of recovery. It not only removes pain and calms the nervous system, but it likewise, in a marvellous manner, sustains the vital powers.

From their position, neither of the two apertures made by the bullet could be utilised in the operation. I, therefore, made a single longitudinal incision at the outer side of the joint, through the deltoid and in the course of its fibres, exposing well the bone. Three small arteries had to be tied. There was no troublesome bleeding. Notwithstanding the muscularity of the patient and the depth of the incision, I got a good view to the bottom of it. Having dislocated the head of the humerus, I dissected out the pieces—more than twelve in number—of the smashed head and shaft. I then examined carefully with my fingers the irregularly fractured end of the humerus, pushing and pulling each of its jagged points, so as to enable me to determine whether the shaft was or was not split down towards the elbow. In musket-bullet wounds, it is not always easy or possible to determine whether a long bone is or is not split, because a longitudinally fractured shaft may be maintained for days in an apparently unfractured state by the periosteum and surrounding tissues. Having come to the conclusion that the remainder of the shaft was sound, I resolved to try to save the arm; and, therefore, forthwith proceeded to complete the operation by removing the irregular end of the bone. My son grasped the arm a little above the elbow, and so manipulated it as to push the bone through the incision, whilst I, holding the extremity to be removed in my left, used a small saw with my right hand. The arm which had been operated upon was then flexed at the elbow, and laid across the chest. It was securely, but with very little pressure of bandages, attached to a concavely moulded oakum padded pasteboard splint, so that it might be easily examined during the day without occasioning pain or displacement. Cold-water dressings were applied by means of light compresses, and were diligently continued during the day. There was a considerable sanguineous oozing for some hours. In the evening, the cavity was syringed with creasote-water, when five or six minute pieces of bone, not much larger than pinheads, were washed out. A more solid style of bandaging was then adopted. A grain of opium was administered when the night-nurses took charge at 9 P.M.

I ought to mention that, with the exception of two or three cups of cold beef-tea during the night, the patient had no food of any kind from the time he entered the ambulance, at or about 6 P M., till near noon next day, on his thoroughly emerging from his chloroform-sleep. He then had, at his own request, a basin of coffee with milk, some bread, and a small glass of brandy.

Immediately after the operation, the patient was able to move his hand, the thumb, and each finger: he could also squeeze tightly with the hand. Sensation in the arm or hand was never in the slightest degree impaired.

For a few days, half a grain of opium was given night and morning: great attention was paid to digestion and alimentation, the latter being generous. By means of a sufficiency of properly placed oakum, the purulent discharge, which soon became very profuse, was removed every three or four hours, the more thorough washings and dressings with creasote-water being performed once in the twenty-four hours. The wound very soon showed a disposition to contract and close. Unfortunately, it was allowed nearly to close about a fortnight after the operation. At that date everything seemed to be going on well, when he was suddenly seized with rigors, and there was great tension and tumefaction in the right mammary region. To this region large poultices were applied. Tincture of cinchona was freely administered. In two or three days, an abscess had declared itself in the upper and anterior aspect of the right side of the chest. When pressed upon, a fulness was perceived in the axilla, and pus was caused to flow from the re-opened operation-wound. Free incisions were made, and drainage-tubes were introduced, so as to prevent matter from accumulating in the axilla, or elsewhere in pouches. This state of matters rendered the daily dressings most tedious and troublesome, but, after a short period, did not apparently interfere with his general well-being. He was keenly alive to the exciting rumours and incidents of each day; slept well; and fared generously. This internal medication was slightly varied from time to time; but his principal medicines were iron, gentian, cinchona, and rhubarb. Occasionally, he had a few grains of grey powder, followed by a smart saline cathartic.

On May 28th, he had been out of bed for some days. On and after the 31st of that month, he was in the habit of spending several hours daily sauntering and sitting in the garden. He had, however, after that date, occasional suppuration near the seat of the operation; and several times, minute scales of bone were detected in the matter which came from the partially healed operation-wound. So late as February, 1872, he had an abscess in the arm, when I removed with the forceps a small piece of the necrosed shaft of the humerus. Since that date, the cicatrisation has been solid and complete.

One year after the operation—that is to say, on April 10th, 1872—I had the photograph taken which I now exhibit. He was then, as he is now, August, 1874, in excellent health. You will observe that he is holding the removed portion of the humerus—three-and-a-half inches in length—in the hand of the operated arm. The fragments have been glued together, as you see them in the preparation now submitted to your inspection. He can make good use of his arm in many ways. He can lift with it great weights, such as large pails of water and baskets of coal; he can write; and can work a sewing-machine with it. He can place the palm of the hand on his forehead. To the casual observer, he seems to do everything with his arm which others can; but it is not so; he cannot stretch the arm outwards far from his side. The false articulation is marvellously strong and flexible. There is not the slightest atrophy of any of the muscles, except the deltoid, which is much smaller than that of the opposite side, though now it has not nearly so wasted an appearance as it had twelve months ago.

I need hardly say that Brunet did not remain under my care till April 10th, 1872, the date of the photography. In the preceding August, when our Ambulance was closed, I tried, without success, to prolong his stay at Sir Richard Wallace's temporary convalescent-house at Levallois-Perret, then in use for the remainder of my wounded; and, after several prolongations of his residence with us, I was obliged to deliver him over to the authorities, a medical inquiry by them having resulted in an official letter to me, stating that he was quite well, and must be removed forthwith. He was imprisoned for some time, and then tried by one of the court-martials installed for many months at Versailles. He was, for reasons not disclosed, acquitted without the infliction of any punishment. On the day of his acquittal, his wife and he, in joyful mood, came to see me. As he entered my consulting-room, I expressed my surprise at seeing him, saying that I thought he had been, or was to be shot. He replied: "I expected either to have been shot or banished for life; but, a few hours ago, the *conseil de guerre* dismissed me without even a scolding, and without calling for the evidence against me." I may add, that he has at last got occupation as a *concierge*, and has retrieved his character. He lost, at first, one situation after another on its transpiring that he had on him the infamous war-brand of the Commune.

[In the *British Medical Journal* for 1871, the late DR. JOHN MURRAY published a series of articles—afterwards reprinted as a pamphlet—entitled :—"*Four Days in the Ambulances and Hospitals of Paris under the Commune.*" In these papers the case of Brunet and other interesting cases under my care at the date of his visit are briefly sketched.

From the general remarks of my lamented friend I take the following paragraphs relating to the treatment of the mutilations of war—a subject to which I may recur on a future occasion.

"The Ambulance Anglaise furnishes in abundance further evidence of the great value of teased *étoupe goudronné* (oakum) which gained a deservedly popular reputation with every one who used it during the Franco-Prussian war. Dr. Cormack believes that much of his success is due to the use of this article of dressing." * * *

"Among the distinguishing features of the Ambulance Anglaise of Dr. Cormack is the scrupulous care bestowed in keeping the wounds clean by effectively syringing out [with creasote water] sinuses and suppurating cavities, and attending to the thorough ventilation and general hygiene of the wards. Each patient is supplied with two sponges, which are used only in dressing his own wounds. They are hung in an oil-skin bag over each bed. General hygienic care will explain the success which up to the present time has attended Dr. Cormack's labours.

"Above 200 cases—sick and wounded together—are either now under treatment, or have passed through Dr. Cormack's care. Twenty-two of the number were not wounded; and seven, when under treatment for their wounds, took diphtheria. One (at Les Ternes) when recovering from a severe gun-shot wound of the chest, took measles, and then scarlet fever, but ultimately left in good health. One (not wounded) died of typhoid fever. A man, after a gun-shot wound of the leg, had smallpox and recovered. One death occurred from pyæmia in a case of wound of the groin and compound fracture of the femur: an *infirmière* wounded on the field died from a piece of shell lodging in the abdomen: and one death from erysipelas occurred in a case where a ball entered close to the anus and came out at the inside of the thigh."]

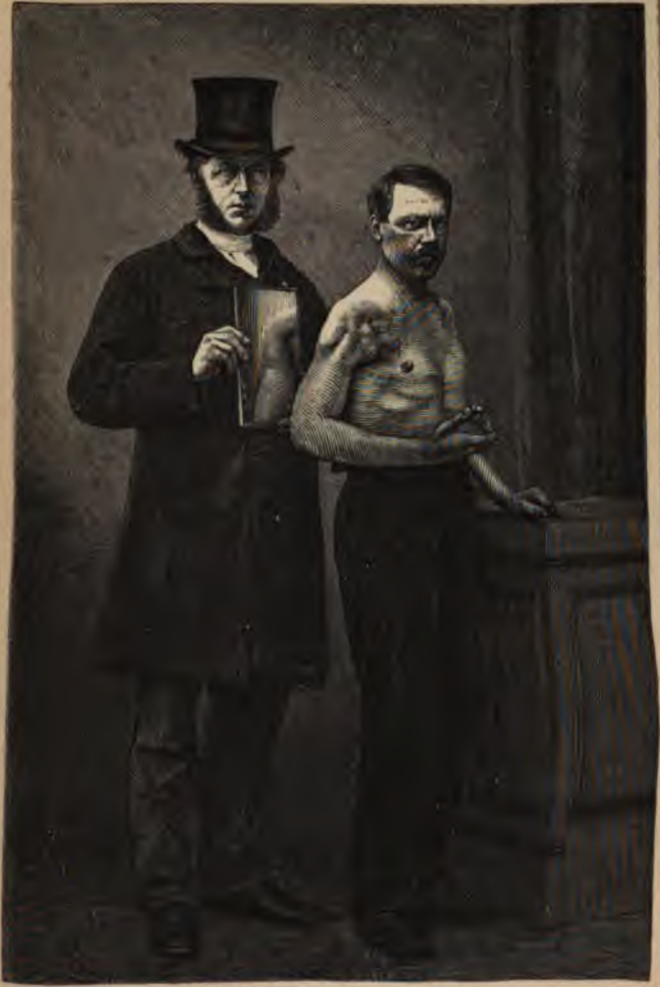
POSTSCRIPT.

At the date of correcting this sheet for the press (24th July, 1876) I am very pleased to be able to add that Brunet retains his situation as *concierge*, is in robust health, and (from increased experience) uses his arm even better than when I read the preceding history of his case at Norwich on 12th August, 1874.

For nearly a year I had not seen him, till we met on the 29th April, 1876, at the funeral of my dear son, John Rose Baillie Cormack. Weeping bitterly, he grasped my hand and said :—" I never liked any one so much as Dr. Baillie : he did not know what fear was, but he was to me and all the other wounded, kind as a brother and gentle as a woman." In justice to Brunet, I cannot refrain from here placing on record his tender appreciation and truthful tribute to my late son—my skilful assistant in most trying emergencies—one who was the joy and the hope of my life. It is pleasant to record that even men of " communistic type " are amenable to kindness, and can love as well as hate their fellow men.

The photograph represents the patient on 10th April, 1872—one year after the operation. It was expected that the mirror would have shown the line of the incision of the operation ; but it fails to do so.

BRUNET. 10 APRIL, 1872.



AMBULANCE ANGLAISE.

XIII.

CONCUSSION OF THE BRAIN.

CONCUSSION OF THE BRAIN.

THE following cases may be described in general terms as typical illustrations of the so-called "concussion of the brain" of authors. The first is worthy of being recorded at length on account of some features of peculiar interest which it presented; and also on account of the minuteness with which it was observed from first to last.

The clinical term, "Concussion of the Brain," is here employed with reserve. We generally have something more than the concussion or shock; and in cases like that of Adolphe Stilling—in which there was hemiplegia and slow recovery—there is probably extravasation of blood within the membranes, or some other lesion.

CASE OF ADOLPHE STILLING:—*Fall on the Head: Partial Hemiplegia: Protracted Unconsciousness resembling Natural Sleep: Recovery.*

Adolphe Stilling, aged fifteen years and a half, a tailor, and the son of a tailor, residing at 96, Avenue des Ternes, was admitted into the Hertford British Hospital on the 1st September, 1874, from which date, till he left the hospital on 25th February, 1875, he was under my almost daily observation, and was sometimes seen by me several times in the same day. During the latter part of his residence in hospital, he was for some time employed as a servant.

History, and State on Admission.

At 9 on the evening of 1st September, 1874, I saw the patient for the first time, having been sent for by Dr. Baillie Cormack, then Resident Clinical Assistant, by whom he had been admitted two hours and a half previously. The patient was brought to the hospital by his father and mother, from whom an exact account of the case was obtained.

About nine in the morning he fell on his head from a ladder, a height of about fifteen feet. His head struck a hard road covered with gravel. Immediately after the fall, he was taken up in a state of insensibility and conveyed to his father's house, which was close at hand. A French medical practitioner was sent for, by whose directions—after he had been undressed and laid in bed—large sinapisms were applied to both legs. They were not removed till he was brought to the hospital. No other treatment had been adopted prior to admission. The father and mother state that they were informed by witnesses of the accident, that immediately after its occurrence, and while a stretcher was being procured for his removal, the patient's mouth was distorted and his features slightly convulsed. The mother says that when she saw her son half an hour after his fall, his mouth was drawn to one side, and his countenance had a vacant mindless appearance. Neither then nor subsequently—though she had never left him—had she seen convulsive movements in the face or in any part of the body.

On admission, his head was shaved; and a bag of pounded ice applied to it, as it was hot, and the face somewhat flushed. The patient looked like a person about to awake from natural sleep, breathing rather quickly but regularly, yawning much and having a perfectly tranquil countenance. Such was his appearance, when under examination in bed at the hospital, twelve hours after falling from the ladder.

The temperature, taken simultaneously in both axillæ, was 39·2° Cent.: the pulse was 100, of moderate strength: and the respirations were 30 in the minute. The mouth and tongue felt hot and dry; and the tongue was stated to be more parched than when he was received. On opening the eyelids, the right pupil was found to be considerably dilated and quite insensible to light: the left was dilated, but in a less degree, and it contracted somewhat when suddenly confronted with the strong glare of a lamp. Not the slightest convulsion, twitching or rigidity of muscles was observed. During the hour which my examination occupied, he was constantly yawning: each yawn seemed—till we knew the contrary from experience—to be notice given that he was going to open his eyes and shake off sleep. He yawned pretty uniformly about once in three minutes. His unconsciousness was complete: in no way could he be roused. Reflex movements were easily elicited. He drew up his legs when the soles of the feet were tickled, and somewhat also when the calves of the legs (very much reddened by the sinapisms) were touched. Fluids introduced into the back part of the mouth were swallowed easily and at once. On putting a spoon or feeder to the lips, he made no prehensile or sucking movement. During the examination, he passed unconsciously a very large quantity of urine. This was his first micturition since the fall, according to his mother's statement.

Over the right parietal protuberance, there was a contusion, a slight abrasion of the skin, and a doughy swelling about the size of a hen's egg. There was no sanguineous or ether exudation from the ears. No fracture of the cranium could be discovered. Except the appearances over the right parietal protuberance, no marks or other evidence of injury to skin or bone, or to thoracic or abdominal organs could be detected.

An exact exclusive *diagnosis* was impossible; but *the treatment* was simple and obvious:—*to maintain life and prevent cerebral congestion.*

I directed a purgative enema to be administered. The bag of pounded ice was ordered to be diligently continued, the cold being so regulated as to prevent undue refrigeration. To soothe the legs, inflamed and blistered by the mustard, large linseed poultices were ordered; and should the feet become cold during the night, it was arranged that turpentine stupes should be applied to the parts which had not suffered from the mustard. His position was occasionally to be gently changed from the back to either side. His alimentation was to be liquid and unstimulating, consisting of beef-tea, barley-water, and milk—a tablespoonful of each to be administered alternately every two hours.

Reports of Case when in Hospital.

2nd September, 10 *a.m.*—During the early part of the night he was restless, but soon after midnight, when the bowels were freely moved by the enema, he became tranquil. Since then he has hardly moved a muscle. His slight occasional movements are reported to be exactly like those of a weary man in a deep natural sleep. He has not opened his eyes since admission. At present, he lies in a state of profound and peaceful coma, which has the semblance of normal repose. The yawning continued more or less all night; and he is now yawning frequently, though less frequently than when reported at nine o'clock last night. On an average, he yawns once in four minutes. When he yawns, his mouth is distinctly drawn to the right side. His general paresis of the left side is shown by his "always working to the right side of the bed," to use the nurse's expression. In his movements, there is a steady progress made towards the right side of the bed, though this progress is only perceived as the aggregate of all the slight movements of two or three hours. It is necessary about once in three hours to draw him to the left side of the bed to prevent his falling out on the right side. Last night, before this was discovered, he fell out of bed an inert mass like a man dead-drunk. He made a feeble attempt to get into bed; and was not injured by the fall. He swallows the alimentary liquids introduced into his mouth; and after he has taken a certain quantity, he pushes his tongue against the feeding tube as if to indicate that he has had enough. This manifestation is the only approach to a semblance of consciousness which he has shown since admission. On opening the eyelids and presenting the pupils to a strong light, both were found to be insensible to it, and to remain, on the presentation and withdrawal of light, contracted to the size of pin-heads. He lies with the head bent backwards; but there is no muscular contraction and rigidity in the neck or elsewhere. The temperature is 38° Cent.; the pulse 78; and the respirations 28. The tongue is rather dry and excepting the point, which is red, it is coated with a loose white fur.

8 *p.m.*—No change in his condition or symptoms has been observed since the report was made this morning. His temperature is 38·4° Cent., being four tenths higher than when taken about 10 a.m.

3rd September, 11 *a.m.*—Since admission he is weaker and paler, although he has taken a fair amount of liquid aliment. He has passed urine in abundance, and unconsciously. Since the operation of the purgative enema, he has not had a stool. There is no venous congestion in the head, face, neck, or elsewhere. He yawns nearly, but not quite as much as yesterday. The pupils are rather less contracted than yesterday: the right pupil is rather less contracted than the left: both are slightly sensible to light: on admitting light equally to both, the right contracts most, and also most quickly. The temperature is 37·8° Cent. The pulse is 64. The respirations are regular and deep, numbering 22 in the minute. The surface of the body is comfortably warm. The head is cool.

Ice to the head to be discontinued. Alimentation to be continued on the basis fixed on his admission, with the addition of an egg-flip containing half an ounce of brandy every eight hours. To have immediately two drops of croton-oil in a teaspoonful of castor-oil, and a purgative enema in the evening, unless the action of the croton-oil should have been very severe.

6 *p.m.*—The croton oil produced a small evacuation of hardened, nodulated fæces, after which a larger and semi-fluid stool was obtained by the enema. Hitherto, he has not swallowed well, unless the fluid was introduced quite into the back part of his mouth; but this evening, several times, I saw that on the feeder touching his lips he sucked. He has not yet opened his eyes. His temperature is 37·6°—the pulse 80—and the respirations 22.

4th September, 11 a.m.—In the early part of the night he was very restless; and for the first time his bowels were observed to be much distended with gas. The flatulent distension and the restlessness both ceased on the administration of a turpentine enema soon after midnight. The nurse states that towards four in the morning, soon after finishing a brandied egg-flip, he made water in the urinal on its being placed *in situ*. He has not yet opened his eyes, nor attempted to speak. I cannot detect any change in his state since yesterday. I fail to elicit any sign of consciousness or semi-consciousness when I slap the nates and speak loudly in his ear. No sign of intelligence or of audition can be elicited by loudly telling him to open his eyes and put out his tongue. At 8 a.m. his pulse was 60, his temperature 36·6°, and his respirations 20. Now, three hours later, his pulse is 70, his temperature 36·8°, and his respirations from 18 to 20. When the observations were made at 8 a.m. he had had neither food nor stimulant for three hours. Half an hour before they were now repeated, he had had a tumbler of milk and an egg-flip containing an ounce of brandy.

8 *p.m.*—Since the morning visit he has taken five ounces of brandy in milk and in beef-tea. The countenance is slightly flushed. The pulse is 80. The temperature is 37·2°. At present, when drinking some milk, he opened his eyes for about 20 or 30 seconds, after which he yawned several times in close succession. Till yesterday it was observed that when he yawned, the mouth was considerably drawn to the right side, but to day, in yawning the mouth is symmetrical. There is slight distension of the abdomen. The legs are red and angry-looking in the situation of the sinapisms applied before admission; and a blush extends from the ankle above the knee in both legs.

Both inferior extremities to be enveloped in a dressing of *linimentum calcis Br. P.* To have four ounces of brandy daily, which is to be equally distributed over the twenty-four hours in his drinks and liquid aliments.

5th September, 11 *a.m.*—In the early part of the night being restless, and having much distension of the abdomen, an enema of turpentine and glycerine was administered. This greatly diminished the restlessness and flatulence but without producing a fæculent evacuation. He is now in his usual deep and tranquil sleep. Since 8 last night, he has not been observed to open his eyes nor give any sign of consciousness. He passes water abundantly and unconsciously. His stools are generally passed after the administration of enemata, so that the bed is rarely soiled with fæces. About half a pint of urine drawn off this morning by the catheter has been examined. The specific gravity was 1.018. It contained neither albumen nor sugar. The tongue is moist, and slightly coated with a whitish slimy fur. The pulse is 66. The temperature is 36·4° Cent.

6th September, 11 *a.m.*—He lies in the same state of apparently natural placid sleep. During the last twenty-four hours he is reported to have been twice seen to open his eyes for about half a minute. He has now opened them for a few seconds. There was no intelligence in his eyes: they were open, but looked at nothing. Since yesterday at this hour, he has taken rather more than a quart of milk, which is a little in excesss of his usual quantity. During the same period he has taken the prescribed allowance of four ounces of brandy. He has had no stool since the night of the 4th, after the enema. His skin is cool, but not cold to the touch. The temperature is 36·6°, the same as at eight this morning. The pulse is 56.

The same alimentation and the four ounces of brandy to be continued. To have six grains of resin of scammony in his next drink of milk.

7th September, 11 *a.m.*—At eight this morning, the pulse was 48, the temperature 36·8° Cent., and the respiration 20. At that time, the feet were cold, but there was no flushing of the face nor heat of head. He had been left too long—about five hours—without brandy, and during that time the nurse admitted that he had had very little of any kind of aliment. An egg-flip containing an ounce of brandy was forthwith administered, while at the same time turpentine stupes were applied to the legs and feet. In half an hour after these measures had been taken, the pulse had risen to 60: the temperature remained at 36·8° Cent., and the respirations at 20. During yesterday afternoon, the scammony produced a consistent and copious stool. His general appearance is exactly similar to that described in previous reports—he looks like one in deep natural sleep. His sleep, however, really is less profound than hitherto. For example on previous days he has not moved when smartly slapped on the buttocks; but on now applying this test, he at once turned round from right to left, and in a few minutes from left to right without being slapped. He now generally passes urine into the urinal when it is placed between his thighs.

8th September, 11 *a.m.*—The day and night nurses concur in stating that he occasionally opens his eyes for a few seconds; and that within the last twenty-four hours he drinks with avidity whenever the feeder is put to his lips. The pupils are sensible to light, but not in a normal degree. Slapping his buttocks roused him more than yesterday; it caused him to start, turn round suddenly, and open his eyes. Till tested in the manner now described, he seemed to be in his usual deep sleep. The pulse is 60; the temperature, 36·6°; and the respirations, 20.

9th September, 11 *a.m.*—He continues in an apparently profound natural sleep. He has, however, twice turned from one side to another without being touched or otherwise roused. He does not seem to be in the least disturbed or affected by loud speaking or noises close to his ears. There is evidence of a considerable return of observing and visual power. On the patient opening his eyes this morning it was perceived by Dr. Baillie Cormack, then making the usual early round, that he had a gleam of intelligence in his expression. He was offered a hand-bell. For an instant, he seemed to look at it, then closed his eyes. On tickling the nares, he again opened his eyes; and when the bell was placed in his left hand he grasped it feebly, and with the right hand took it out of the left, moving it, as if he wished to ring it. He did cause it to ring a little. An ineffectual attempt has just been made to get him to repeat the bell-performance. In other ways, his returning intelligence has been proved. Having got him to open his eyes under active rousing measures, I put out my tongue and touched his lips with my finger. He forthwith opened his mouth to a certain extent, and slightly protruded his tongue. When the urinal was placed in position he at once began to pass water in an abundant stream. He has never yet been observed to keep his eyes open for more than two minutes at a time, and he generally closes them in less than half a minute. On rare occasions, he opens his eyes spontaneously; but in general it is only when he has been roused that he opens his eyes even for an instant. He is now more easily roused than on any occasion since admission. The tongue is clean and moist. In respect to temperature, pulse, and respiration, he is as yesterday.

10*th September*, 11 *a.m.* With the pulse 58 and the breathing regular, he lies in a profound sleep. It is much more difficult than yesterday to rouse him. He swallowed well an egg-flip containing an ounce of brandy; and in five or six minutes afterwards spontaneously opened his eyes. The bell was presented to him. He feebly smiled—took it in his right hand and rung it—looked about wonderingly—rung it again—and then closing his eyes fell into his wonted lethargy—from which directions were given that he should not be roused for an hour. He now yawns much less; but half an hour seldom passes without two or three successive deep yawns. He moves much more in bed. The tendency to get to the right side of the bed continues; and to prevent his falling out, the barrier attached some time ago to the bed is still required.

Noon.—Exactly an hour after leaving him, I returned. He had not been fed, roused, or in any other way interfered with. His pulse is 64, regular, and of good strength. When feeling his pulse, he started at a loud and sudden noise. Observing this, I spoke to him in a loud voice close to his ear telling him to blow his nose. He opened his eyes, looked at me and at the offered hand-bell and then turned away as if to show annoyance at being disturbed.

13*th September*, 4 *p.m.*—Since the 11th his sleep has been very profound. I visited the hospital this afternoon accompanied by some friends, including The Right Hon. Lyon Playfair, M.P., Dr. Arthur Mitchell, Commissioner in Lunacy for Scotland, and Dr. R. H. Semple of London. During the time that we remained round the patient's bed, discussing his case and examining him in various ways, he continued in a profound sleep, unaffected by loud noises, and making no sign when pricked or pinched. Only very slight reflex action was excited by tickling the soles of the feet.

19th September, 11 *a.m.*—From the 13th till last night he continued in very much the same state. He had been taking his aliment well, ringing his bell occasionally, and smiling like a pleased child at the performance. He had never been thoroughly awake; nor has he yet opened his eyes for more than two or three minutes at a time. Last night he was seized with violent rigors, and after they ceased he became very hot and restless, and was less easily roused. On examining a sore on the right leg caused by the sinapism applied before admission, and which has never healed, it was found to be the starting point of an erysipelatous inflammation already half way up the thigh. The limb was swollen and tense. At midnight, the temperature was 39.6° Cent., the pulse 100, and the respirations 32—pretty nearly the present figures. His abdomen is tympanitic. He occasionally twitches the muscles of the face, and jerks the left arm. To protect him from the flies, he has had recently a piece of muslin placed on his face. This for the first time to-day has annoyed him. He has so often snatched it off that the nurse has ceased to replace it.

25th September, 11 *a.m.*—He has since the 19th suffered very much from the attack of erysipelas which then began. Both legs became involved, and the redness, which ascended over the front of the abdomen, reached up to the umbilicus. The temperature in the morning, taken about eight o'clock, has ranged between 38.2° and 39.0°; and the evening temperature, taken about nine o'clock, has ranged between 39.0° and 40.4°. The twitchings and jerkings continued more or less till yesterday, but they have been throughout very moderate in degree. The erysipelas has been treated locally by keeping the affected parts constantly swathed in a dressing of the *linimentum calcis* of the *Br. Ph.*, and by the internal administration of a mixture containing the sulphates of iron and quinine. Great attention has been paid to alimentation, which has been similar in quality but less in quantity than the fare he had before the erysipelas supervened. From the first day of the erysipelas till to-day, the sleep and unconsciousness have been as profound as they were before the indications of progressive amendment which showed themselves between the 7th and the 19th September. Since seven o'clock this morning his sleep has been less profound and his hearing more active, as has been shown by opening his eyes when spoken to, and his moving his lips to receive the feeder on being told to do so, without being touched. He has just now spoken for the first time since admission. After much rousing and coaxing—the latter being evidently an essential element in the proceeding—he opened his eyes, and then looked into my face. In reply to my question—"*Are you better?*" he answered in a gentle, very distinct whisper—"*Yes, Sir.*" Under the combined influence of rousing and coaxing, he several times put out his tongue and also rang the hand-bell. His manner was exactly like that of a person exceedingly annoyed at being roused out of an unfinished natural sleep; and at last, when spoken to, he ceased to make any sign. After he had been allowed to rest in peace for one hour, I returned to him. He had a compressible pulse of sixty. I offered him a tumbler of bitter ale, putting it to his lips. He immediately drank it with avidity; and afterwards ate a thin slice of buttered bread, being his first mastication since admission. The erysipelatous redness has nearly faded away; and neither swelling nor tension of the limbs remain, except an œdematous state of the right foot. In the right gluteal region there is an isolated patch of superficial ulceration: it existed before the erysipelas appeared; and it has now begun to slough. He has no other bed-sore. He has had during the last week two or three drenching night sweats, and some liquid dark coloured stools. There is often a dribbling of saliva from the mouth.

26*th September,* 11 *a.m.*—When the ward was being arranged this morning, he looked about inquiringly, following persons with his eyes as they moved. Seeing this, the nurse asked him if he wanted anything, when he replied in a distinct whisper—"*Ale.*" Dr. Baillie Cormack entering the ward at the moment repeated the question—"*Do you want anything?*" and received a similar reply. A glass of bitter ale was handed to him: he tried to take hold of the glass, but his grasp being feeble and his arm unsteady it was raised to his lips, when, as on the former occasion, he drank the ale with avidity. Almost immediately afterwards, he fell into a deep sleep—in which I found him, and in which he remained during my visit to the wards, which occupied an hour and a half.

8 *p.m.*—He has slept continuously since the forenoon visit, except once for a few minutes during the afternoon when for the first time since admission he recognised his father and mother. He put forth his hand to each, smiled, turned on his side and again fell asleep. When asked to urinate, or take his nourishment at the stated times, he complies with the request after a very little rousing.

27*th September.*—He was visited at 11 a.m. and 8 p.m. The day has been passed much as yesterday. On both days his morning temperature has been 37·0°, and his evening temperature 37·4°. His pulse, when he was asleep, has been about 60, but when roused to take food or for necessary purposes it has (as has been remarked throughout his illness) gone up from ten to fourteen beats. When his father and mother were asked to day what they thought of his countenance when he recognised them yesterday, as compared to what it used to be when he was in his usual health, they replied that they were both struck with its vacancy. They made other remarks which are correct and noteworthy, viz.—that each word he articulates seems to be the result of study and effort—that his answers follow the questions at a long interval—that he seems to feel his tongue to be too large for his mouth—and that he still has a dribbling of saliva. There is no distortion of features. He turns in bed frequently of his own accord from side to side, and uses both legs with apparently the same power. There is a difference however, as the aggregate of his movements still brings him at the end of some hours to the right side of the bed; and unless he were kept in his proper place, he must many times have fallen on the floor.

5*th October*, 11 *a.m.*—During last night, from great pressure of duty in the ward, the nurse relaxed her vigilance in attending to his position in bed: the result was, he fell out at the right side on the floor. The tumble seems to have done him no harm. His fall was heard at once, and before the nurse reached him he had, unaided, got into bed. In less than five minutes, he was sleeping quietly as if nothing had happened to him. From the 27th September he has been gradually becoming less somnolent, but the change from day to day has been hardly appreciable. He takes a sufficient amount of food. He refuses everything which requires to be chewed except buttered bread. The bowels are moved daily, the aid of a lavement being, however, generally required.

20th October, 11 *a.m.*—There has been no change since the 5th in the character of the symptoms, though his condition has been gradually improving. He has been several times awake for about an hour during the last three or four days. He has never yet spoken except in reply to short and clearly put questions. Questions, moreover, generally require to be repeated several times before an answer is obtained. To test his state, I caused him to walk supported by a nurse on each side. After three or four steps his pulse failed, he began to totter, and had to be laid in the recumbent position in his bed. His pulse in a few minutes returned to its usual standard, and he fell asleep.

1st November, 11 *a.m.*—There has been a slow, but steady improvement since the 20th October. The walking experiment was repeated to-day for the first time since that date. He walked thirty or forty steps feebly, but not with any indications of discomfort or faintness, till, all at once, he staggered, and had to be laid on his bed. In a minute or two he seemed to become as well as he was before he staggered. I asked him to describe the kind of discomfort which he had experienced before and when he staggered. After a long and apparently ruminating pause, he pronounced the word "*giddy*" in a low voice; and then smiled, as if pleased at his success in finding and uttering the proper word.

To have with his two principal meals at 9 a.m. and 3 p.m. a carbonate of iron pill of the Br. Ph., to discontinue the brandy, and in place of it to have eight ounces of Bordeaux wine in the twenty-four hours.

It was also ordered, that he should sit up in bed, or in an easy chair at the fireside, for half an hour, forenoon and afternoon, this period to be gradually and cautiously prolonged, in proportion to his improving health and strength.

1st December.—Excepting two or three days of headache, coincident with constipation and indigestion—the latter the result of too hearty eating—he continued to improve rapidly till about the 20th November—since which date, his amendment, without any discoverable cause, has progressed much more slowly. He still passes the greater part of his days and nights in deep quiet sleep. During the day, however, for two or three consecutive hours, he lies with his eyes open, and seems to be observing what is going on around him. He is less anæmic, and has a firmer pulse. His expression has much of that peculiar mixture of seeming abstractedness so often presented by fever patients. All who have to do with him say that he is obliging and good-natured, but provokingly stupid. One of his relations after seeing him the other day remarked, that it would have been better for the lad to have died than to have recovered to pass through life an idiot. Notwithstanding these hard sayings, his intelligence, though still much enfeebled, is evidently returning as time passes on.

15th December.—Since the first day of this month his progress has been in all respects steady, and within the last few days it may be described as having been rapid. He is still very slow in answering questions, and becomes at times confused in his statements when he joins in a general conversation. He walks slowly, holds himself very erect, seems always as if carefully balancing himself, and avoids stooping. My attention having been directed to-day to this latter peculiarity, I allowed a book to fall from my hand, and immediately requested him to pick it up, which he did with manifest unwillingness; and in presenting it to me he staggered giddily. When interrogated in respect to his sensations in stooping, he described them by stating that they were sensations of giddiness, blindness, and dull pain in the head. He added that they were becoming much less troublesome than they had been; and that now, if he rose up very slowly after stooping, he hardly felt them. He takes great pleasure in assisting the nurses in the service of the ward. He only sleeps now for about half an hour twice during the day, the sleeping times being after breakfast and dinner.

To discontinue all medicines, and to have ordinary diet.

1*st January*, 1875.—Except that he has still a rather vacant look, and feels giddy when he rises up suddenly after he has stooped, there now remains no appreciable symptoms of his illness. His time is occupied all day in light work, such as cleaning and trimming the lamps, and doing little services for the patients under the direction of the nurse. In accordance with his formal application he was appointed a few days ago to assist in scullery and kitchen work. This arrangement was the more readily sanctioned, as in consequence of his father's death on 4th October, his mother had been obliged to break up the family home and remove with her children to England.

31*st January*.—He has gone on well till a few days ago, when he complained of intense headaches every morning, coming on soon after leaving bed in the morning, and continuing the greater part of the day. As he was unable from these headaches to do his moderate routine of work, he was to-day taken back into the ward as a patient. A small blister was applied to the nape of the neck, which is to be kept open by issue ointment. Excepting with respect to wine, the diet is as at present to continue to be the ordinary hospital diet. He is to be moderately purged twice a week.

25*th February.*—He left the hospital to rejoin his family in London. Since the 4th or 5th February, he has seemingly enjoyed perfect health. The blistered surface was kept open for a fortnight: its closure was not attended by a return of headaches or other inconvenience. Since his return to the ward he has acquired flesh, colour, and strength. Friends who have come to visit him, state that he looks stronger and in all respects better than he did prior to his fall from the ladder. He has quite lost his vacant expression; but the slowness with which he answers questions is observable, and his avoidance of joining in a general conversation remains. For some days past he has given active voluntary assistance in carrying heavy baskets of coals and pails of water to the upstair rooms.

Towards the end of April I saw a letter which he had written a few days previously to one of the nurses, stating that he was quite well, and was endeavouring to get employment as a porter or messenger in a warehouse. The letter was a very creditable production for an illiterate lad, and showed no sign of cerebral disease. Since that date I have not had any news of him.

The sloughing sore on the right buttock healed very slowly, and the separation of the slough was a tedious process. The situation of the slough when the patient left the hospital was occupied by a large and somewhat concave cicatrix. Although the nurses, I believe, did their best to prevent the patient from chiefly lying on his right side, that was his general decubitus. I rarely found him in any other position. The sloughing bed-sore may therefore, to a certain extent, be explained by the constant pressure to which the part was subjected. At the same time, I believe, it had a special relation to an intracranial lesion. If a picture of the sloughing parts had been made, it would have been almost identical with a drawing given by Charcot (Vol. I, p. 93) of a sloughing sore of the buttock on the paralysed side in a case of hemiplegia from cerebral hæmorrhage. In my patient, as in the case figured by Charcot, there was an erythematous zone surrounding the slough. These sloughs are no doubt as Charcot and others state *trophic changes*—changes due to the impaired nutrition of the parts caused by brain-mischief.[1]

We can never be certain that recovery in cases of this description is of an absolute and permanent nature. Generally some damage remains which will show itself, sooner or later, by slight or serious symptoms. I have four patients who consult me from time to time for infirmities and ailments which they trace back many years to falls and blows on the head. Three of the persons to whom I refer are in the apparent enjoyment of good health, and are daily conducting themselves in society and in business very much like other people. They are nevertheless from time to time complaining of loss of memory, frequent headaches, and a distressing confusion of ideas after study, or when writing letters requiring any mental effort. Irritability of stomach and an intolerance of alcoholic stimulants, deafness, and loss of smell are also common infirmities in patients who have "recovered" from "concussion of the brain."

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[1] The subject of trophic changes consecutive to lesions of the nerves, brain, and spinal cord is very ably treated by CHARCOT in the first four Lectures of his work, entitled :—" Leçons sur les Maladies du Système Nerveux, faites à la Salpêtrière." The first volume appeared in 1875: the second is now appearing in parts. Some branches of the subject have also been recently elucidated with great ingenuity by BROWN-SÉQUARD. BASTIAN in his work on " Paralysis from Brain Disease in its Common Forms," (London, 1875) also gives a good summary of it.

Lately a case was submitted to Dr. Ball and me for our opinion as to an allegation of a gentleman, that notwithstanding his apparent restoration to health and capacity for business, his brain was permanently unfitted for its previous work by injuries sustained in a railway collision. The gentleman had been insensible for eight days after the accident; and had to remain for more than six months under medical treatment at a distance from his home. The Company offered a sum of money as damages in addition to payment of hotel expenses and medical attendance. The offer was declined. The Company held out—maintaining that there had been complete recovery, and that the gentleman was directing his business as before, and that therefore the damages claimed were excessive. This was denied; and proof was adduced to show that since the accident, much of the continental travelling and head-work had been of necessity delegated to a paid substitute.

Dr. B. Ball and I met in Paris an English physician representing the Company, and explained to him the grounds upon which we regarded the recovery as incomplete. The matter was very soon afterwards satisfactorily settled, due weight being given to our opinion as to the possible existence of permanent cerebral injury.[1]

In the year 1850, a boy returning from school jumped up on the steps of an omnibus passing along the High Street of Putney, and climbed up to the roof, which he had just reached, when the driver suddenly pulled up the horses which caused the boy to be pitched on his head. He was taken up insensible, and carried to my house. Seeing the nature of the case, I at once had him placed in my carriage, and drove with him to his mother's residence, a distance of three miles He remained insensible for five days. In three months, he resumed his school attendance. His sleep was very much of the same character as that of Adolphe Stilling during the first five days. It approached, however, much more to the nature of somnambulism. For example, on two occasions, without awaking, he got out of bed and went in response to a natural call, to a privy situated outside the house, and returned to bed to resume his quiet sleep. He was not a somnambulist before the accident, but for fully twelve months afterwards his sleep-walking was a cause of great anxiety to his family. I was told by the mother of this boy, eight years after his accident, that he was subject to intense headaches, and was decidedly deaf. She attributed both infirmities to the fall on the head, as it was not till after its occurrence that they troubled him. Her opinion was I believe quite correct.

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[1] Blows on the head give rise to cerebral abscesses and tumours. See article "Cerveau (Pathologie)" by Ball and Krishaber in the Dictionnaire Encyclopédique des Sciences Médicales, vol. xiv, p. 482. Paris, 1873.

In this case a constant succession of small blisters on the head and nape of the neck contributed in a marked manner to recovery.

Recoveries are not always real and permanent, as is shown by the following case.

CASE OF CHARLES STILLING:—*Blow on the Left Temple: Insensibility for about Four Hours: Illness for a Week: Subsequent Headaches: Between Seven and Eight Months after the Blow, Sudden Collapse, followed by Death in*

44 Hours: Autopsy—Extensive Lesions of Brain and Spinal Cord.

Charles Stilling, an Englishman, a tailor, aged 42, residing at 96, Avenue des Ternes, was brought to the Hertford British Hospital on a stretcher, in a state of collapse, at 7 p.m. on Friday, 2nd October, 1874.

On the morning of the same day, he had come for advice to the ordinary bi-weekly consultations at the hospital. He complained of flatulent distension after eating, and headache, which he said was dull and persistent, but not intense. He stated that he was subject to occasional attacks of severe neuralgia in the head, for which he had repeatedly taken quinine with advantage; and that his present headache was quite endurable as compared to the other—the "neuralgic headache," as he termed it. His general appearance was that of an ill-fed, dyspeptic, etiolated artizan. His pulse was 60 and compressible. His tongue was furred and slimy. In reply to inquiries into his past health-history, he made no reference to serious illnesses or accidents. With the exception of "neuralgic headache," and one or two illnesses, he said that he had always enjoyed fairly good health. I prescribed a mild cordial aperient mixture, of which a dose was to be taken daily for a few days, an hour before his first repast in the morning: and I also directed him to take ten minutes after each of his two principal meals, well stirred in water, a powder composed of ten grains of the subnitrate of bismuth, two grains of rhubarb and three grains of *pepsina porci.* After the consultation, he made natural and sensible inquiries regarding his son Adolphe, then under my care in the hospital.[1] Throughout a long conversation which followed in relation to his son's state and health prospects, he showed ordinary intelligence and the natural affection of a father. He answered with evident thoughtfulness the questions addressed to him regarding his son's disposition, mental capacity, and physical state prior to the fall for which he was admitted to the hospital.

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[1] For the case of the son Adolphe Stilling, see pages 459 et seq. of this volume.

On the following day—Saturday, 3rd October—I found him, at my usual visit, at 11 a.m., in an apparently moribund state. His condition was said to be very much the same as when he had been received by Dr. Baillie Cormack on the evening of the preceding day. Notwithstanding the diligent and judiciously regulated employment of internal diffusible stimulants and of warmth to the external surface, he had remained unable to speak, very cold, and nearly pulseless, since admission.

His wife, who came with him to the hospital, stated that his seizure had occurred suddenly at 4 p.m. She said that all at once he became cold and deadly faint, and in about a quarter of an hour vomited bile and undigested food. After a pause of half an hour, he again vomited, the matter then thrown up being like tar in colour and consistence. From this statement of his wife, and the symptoms which presented themselves on his admission, the urgent danger was looked upon as resulting from internal hemorrhage. The treatment was conducted in accordance with that diagnosis. On examining the case, I concurred in the view which had been taken of it, and directed the treatment to be continued. Next morning (Sunday, 4th) at eight o'clock, it happened that Dr. Mac Gavin kindly came to assist me in a surgical operation, my hospital colleague, Dr. Herbert, being absent from Paris. Before proceeding with the operation, we carefully examined Charles Stilling. Our conclusion was that he was moribund from internal hæmorrhage. He died before noon. The diagnosis was incorrect.

AUTOPSY :—*Tuesday*, 6*th October*, 1874, 11 *a.m.*

State of Body.—There was no cadaveric odour or any sign of decomposition. The whole of the back part of the body was of a deep purple hue. The cadaveric rigidity was very imperfect. In making the examination, it was observed, that whenever a vein was cut, black fluid blood poured out. The thoracic and abdominal cavities soon became filled with fluid blood, which also poured over the table and ran along the floor in a stream. Notwithstanding this enormous draining of blood from the body, the thoracic abdominal and pelvic viscera remained engorged with blood. The body was not badly nourished, and the quantity of fat was normal.

The *Thyroid body* was very large:

Thorax.—At the upper and anterior parts of the chest, there were slight pleural adhesions of old standing. Both *lungs* were removed from the body and carefully examined. Except engorgement, neither lung presented any abnormal appearance. The weight of both lungs together was 2 kilogrammes and 290 grammes. The *heart*—which was flabby—weighed 470 grammes. All the cardiac cavities contained fluid dark coloured blood. There were neither clots nor coagula in the heart.

Abdomen and Pelvis.—The *stomach* and *intestines* presented no abnormal appearances, and contained no extravasated blood. The weight of the *liver* was 1 kilogramme and 495 grammes. This organ was congested, but in other respects was in a normal state. The *spleen* weighed 195 grammes: it was congested. *Kidneys*.—The weight of the right kidney was 147 grammes. It was in a state of extensive cystous disease. Between and among the cysts there remained some renal tissue. A section of the organ had a honeycombed appearance. The pelvis of this kidney and its ureter were much distended. The fluid contained in the pelvis of the kidney and in the cysts was tested chemically, and found to be of the nature of urine.[1]

The left kidney weighed 137 grammes. When examined under a magnifying glass a number of very small cysts were detected. They were evidently—as were also the cysts in the right kidney—produced by the obstruction of uriniferous vessels. The *bladder*, which contained a large quantity of urine, was free from disease.

The *skull* was examined with great care, without any trace of fracture being detected.

The *encephalon* weighed 1 kilogramme and 480 grammes. The brain was quite dry: there was no subarachnoid fluid. In the right hemisphere there was a cavity, as large as a duck's egg, lined by dense tissue and containing pus. From a rent in the walls of this cavity, pus had flowed into the right lateral ventricle and into the base of the skull generally. At the situation of the rent, the walls of the abscess were soft and attenuated.

Spinal Cord.—The vertebral canal was opened with great care, the whole spinal cord, within its membranes, being exposed *in sitû.* On dividing by an incision the spinal cord from the encephalon, a thin purulent-looking fluid exuded from between the cord and its envelopes, accumulating in the base of the calvarium in considerably quantity. Between the osseous case of the cord and its dura mater, there lay a stratum of pultaceous matter which extended from the occipital foramen to the cauda equina. On laying open the theca vertebralis there was seen in its entire length, a milky sero-purulent fluid similar to that which has been mentioned as having flowed into the calvarium when the encephalon was divided from the spinal cord. There was extensive softening of the posterior columns of the spinal cord in the situation where it gives off the lumbar plexus. There were also patches of softening on several other parts of the same columns.

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[1] See remarks on *Cystous Kidney*, VOLUME FIRST, p. 519.

A remarkable feature in this case was the patient's ability to pursue his ordinary avocations up to within a very short period of the sudden breakdown which so speedily terminated in death. Till after his death, I had no information as to the history and the cause of the diseased conditions under which he succumbed.

Between seven and eight months before his death, he went on a temporary engagement to Nice to work at his business. A week or two after his arrival in that town, he and a fellow workman were amusing themselves by swinging an ordinary wine bottle attached to a cord. When his comrade was swinging the bottle, it slipped from its attachment, and with great force struck Stilling on the left temple, inflicting a deep contused wound, which bled profusely for half an hour. He remained insensible for about four hours after the blow; and for nearly a week, he felt very unwell. His wife cannot recall the exact nature of the symptoms under which he laboured during that time. All she remembers is that for a week his head was tied up; and that during the first three days after the accident he was unable to work. Ever since the accident, he had been subject to severe headaches coming on abruptly, and ceasing equally suddenly. These headaches have been generally confined to the temple where he was struck, and to the back of the head: in the latter situation, the pain has been most intense. If touched even slightly on the temple where he had been struck, a peculiar and intense pain was immediately excited. He used to compare the pain thus excited to an agonising pang, vibrating through his head like the note of a piano.

The physician who treated him at Nice told him that the blow had given him a "concussion of the brain," and that his headaches were "neuralgic."

The deceased is described as having been generally temperate in his habits. Both at Nice and at Paris, his food and all his comforts had been scanty.

Prescott Hewett in his Treatise on Injuries of the Head, contributed to Holmes's System of Surgery—opens his chapter on Concussion of the Brain with the following paragraphs:

"A man receives a blow on the head, by which he is only stunned for a longer or shorter period. What is said to have happened? Concussion of the brain.

"A man dies instantaneously, or lingers some time perfectly unconscious, after an injury of the head: there are no marks of external violence. Again—What is said to have happened? Concussion of the brain?

"The head is opened and what is found? In one case, no deviation from the healthy structure; in another, simply great congestion of the cerebral vessels; in another, numerous points of extravasated blood scattered throughout the brain substance; in another, a bruised appearance in some parts of this organ. In all, the case, in common parlance, is said to have been one of concussion of the brain.

"Such are the after-death appearances ascribed by different surgeons to concussion of the brain.

"The teaching of the different schools, then, is that in simple concussion we may either find nothing in the brain to prove that this organ has sustained any injury, the brain-substance and its membranes appearing to be perfect in all their parts, or we may find certain lesions plainly showing how much the cerebral substance has suffered.

"But it behoves us carefully to examine and see how far we are justified nowadays in admitting that these various appearances do really belong to simple concussion of the brain."[1]

In the course of the same article, Prescott Hewett remarks:—"There is many a case recorded by eminent surgeons, and, as a matter of course, quoted over and over again, in which partial paralysis and loss of memory are said to have taken place after, and to have been due to concussion of the brain. But here too, it is much more probable that effects such as these were due not to concussion only, but to some extravasation of blood, or to some local injury done to the brain substance."

The study of cases such as I am now recording, and statements such as have been now quoted, show that the term "concussion of the brain" is only a conventional term applied to different cerebral lesions of difficult diagnosis.

Speaking of slight cases of concussion, where the patient is only stunned for a short time and then recovers his senses completely, Prescott Hewett says:—

"It is usually supposed that here there is only some disturbance in the circulation of the brain, which being but slight, soon passes off. As may be readily supposed, it happens but very rarely that there is any opportunity of examining the state of the brain in these slight cases of concussion. Sometimes, however, in cases where very slight concussion has existed, death does occur, not from the injury done to the brain, but from some other severe lesion. And in two cases of this kind which I have had an opportunity of examining, and in which symptoms of concussion, of the slightest nature, had altogether passed off within a very short time, I was surprised to find that the brain-substance itself was actually injured. In one case, in which after a blow on the head, there had been mere giddiness for a few minutes, and then complete recovery, some patches of contusion were found at the base of the brain, marked by minute specks of blood closely clustered together: these patches were in two or three cases of the size of a shilling, and extended about a line in depth into the substance of the brain: there were no disseminated specks of extravasated blood. In the other case, after a fall on the back of the head, the symptoms of concussion soon passed off, and the patient died of some other disease eight days after the accident. In the cavity of the arachnoid, and adhering to its parietal layer, were found thin layers of extravasated blood. The large veins on the surface of the brain were congested; the brain-structure itself was much darker than usual from congestion; and in the centrum ovale, close to the right side of the corpus callosum and extending partly into it was extravasation of blood of the size of a nut. This clot still retained the greater part of its colouring matter, but the cerebral structure around it was neither discoloured nor softened. Well-marked traces of injury were found after death in the brain itself in both these cases. May not such lesions also exist in many so-called slight cases of concussion of the brain which recover? My own impression is that such appearances exist more frequently than is generally supposed."[1]

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[1] HEWETT (Prescott):—in Holmes's System of Surgery, vol. ii, p. 298. London, 1870.

A case somewhat similar to those referred to by Prescott Hewett as "so-called slight cases of concussion of the brain," came under my notice when serving as a military surgeon during the German siege of Paris. A soldier who had been struck on the right temple by a fragment of a shell was placed in one of my carriages about an hour or two after he received the blow. The contusion showed that the fragment was blunt, moderate in size, and also that it possessed no great velocity when it struck the head. The blow, however, had stunned the man. When picked up he was unconscious; but at the close of our journey to Paris, which was slow and jolting, being over rough ground and mostly in the darkness of night, he awoke from his stupor, asked for water and drank it with avidity. I did not examine this man till he was being undressed in Paris—about twenty hours after the blow had been received. He was then confused in manner, drowsy, and complaining of headache when interrogated. The notes of this case are very scanty; but he never had paralysis and the head symptoms continued only two days. I remember exchanging a few words with the patient at my morning and evening rounds, and prescribing for his dysentery, under which he succumbed three weeks after the battle in which he received the contusion. At the autopsy we found, over a large extent of surface, a thin subarachnoid layer of nearly decolorised blood: we failed to detect the source of the extravasation. There can be no doubt that this effusion of blood occurred at the time of the injury.

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[1] Op. cit., p. 304.

Congestion of the pia mater is probably always caused by a stunning blow on the head. It may exist as the sole morbid change; or together with it there may be some positive structural lesion. In all cases, however, the condition which has to be treated is *cerebral congestion.* To carry out this simple principle in practice, it is necessary to make a special and minute study of each patient, and of each symptom, particularly keeping this point in view, that together with congestion there may probably exist some lesion of the structure of the encephalon likely to be rendered more dangerous by a sudden or rapid change in the intracranial circulation. When the case is recent, however profound the unconsciousness may be—unless the lungs or heart are dangerously affected by engorgement—it is far safer to relieve the congestion of the brain indirectly and gradually by hydragogue cathartics, diuretics, and diaphoretics, and by the application of blisters to the nape of the neck, than suddenly by leeching or cupping the temples, or by bleeding from the arm. For the same reason, we must be exceedingly circumspect in the internal administration of stimulants and the external application of cold to the head. Dangerous reaction may suddenly supervene under the incautious use of these means.

The leading principle of treatment, therefore, is to relieve cerebral congestion, cautiously, sometimes tentatively, and never in accordance with any formulated routine of supposed universal suitability. In carrying out the principles of relieving the congestion of the brain, we must of course very watchfully promote the normal functional exercise of the organs essential to life. By pursuing the course now indicated, we give our patients the best chance of recovery.

XIV.

GENERAL PARALYSIS WITH INSANITY.

GENERAL PARALYSIS

WITH

INSANITY.

PARALYSIS, hallucinations, delirious conceptions of grandeur, and other symptoms, after being carefully examined and weighed by the physician, frequently lead him to adopt an unfavorable prognosis in the cerebral affections of patients whom he has afterwards the supreme satisfaction of conducting to complete recovery. The study of such cases is intensely interesting and instructive. They tell us cheeringly, moreover, that there are circumstances in which we are justified in even hoping against hope.

The case about to be described is one of the many which strongly teach this lesson, so beneficially sustaining both to patients and practitioners in every department of therapeutics. It may be read as a little supplement to a valuable series recorded by Baillarger in the fourth chapter of his unfinished work on the Symptoms of General Paralysis in their Relations to Insanity.[1]

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[1] "Des Symptômes de la Paralysie Générale, et des Rapports de cette Maladie avec la Folie." Par le Docteur Baillarger, Médecin de la

This chapter is entitled "Insanity from Congestion, attended by severe symptoms of General Paralysis, and terminating in Recovery" ("Folies congestives avec symptômes graves de Paralysie Générale, terminées par la guérison"). The thirty-six cases recorded in that chapter, and fifteen others described in the third chapter of the same work, furnish examples of different forms and varieties of insanity which the author groups together under the term "congestive." In some of the cases there occurred delirious conceptions of grandeur, associated with inequality of the pupils, and muscular excitement. In other cases, there occurred hypochondriasis, trembling of the limbs, stupor, unequally dilated pupils, and cutaneous anæsthesia. In other cases, again, together with the symptoms now enumerated, there existed an intermittent thickness of speech, and a shuffling, dragging gait, suggesting that there was a greater amount of pressure consequent upon a greater amount of congestion. Baillarger regards "congestive insanity" as frequently curable, and maintains that it is different from primary paralytic dementia, commonly designated the "general paralysis of the insane" in English works. The greater number of Baillarger's cases of congestive insanity are considered by many as cases of the general paralysis of the insane in its first stage. The opinions of Baillarger regarding congestive insanity (*folie congestive*) and general paralysis (which latter he considers as entirely different from lunacy) are personal to that eminent physician. They have not yet been adopted by

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Salpêtrière. Appendice au 'Traité des Maladies Mentales' du Professeur Griesinger. Paris, 1869.

Baillarger's Appendix to Griesinger stops short in the middle of a sentence, as if the author had abandoned his subject in despair at its difficulty.

the profession in France or elsewhere. Whatever view is correct as to the pathology of the cases now under consideration, it must be admitted, that they can seldom be distinguished, except by the fact of being cured, from hopeless cases of the general paralysis of the insane. The practically important matter is to study the circumstances under which the recoveries take place, and to inquire whether nature has suggested a rational method of cure.

CASE OF MISS A. B. *Symptoms of General Paralysis with Insanity: Incomplete Hemiplegia: Carbuncle: Recovery.*

On March 12, 1875, I received a telegram requesting me to visit that evening, at a certain address, Miss A. B., a lady stated to be then on the road from a distant town to Paris, accompanied by a female attendant, who was the bearer of explanatory letters. When I reached the house indicated in the telegram, I was informed that the patient had arrived about half an hour previously, much exhausted in body and very excited in mind. With difficulty she had been induced to go to bed. As the attendant could not leave her charge, even for a few minutes, to speak with me in private, I was at once ushered into the presence of my patient without receiving any information as to the symptoms or nature of her malady. Certain letters, however, were placed in my hands as I entered. The room was imperfectly lighted by a candle placed at some distance from the bed on which the patient lay, and to which I advanced, to reciprocate what I had supposed erroneously to be her courteously offered hand of welcome. I almost at once discovered my mistake, and concluded that the lady was in an unsound state of mind. As I approached, she implored me to keep away from the bed lest I should hurt her sleeping baby. I said that I would avoid touching the baby, which quieted her for a few minutes. She soon, however, began in an excited manner to address me on a variety of subjects, sometimes as her husband, and sometimes as her banker—her great wealth and her social position being the burden of her discourse. Her articulation was thick and difficult. She was an elderly maiden lady of comfortable means; but she believed that she was a married lady travelling in great state, with a very rich husband and first-born son. I soon discovered that she had several hallucinations and delusions, the idea which dominated being that she was the mother of an infant, once stolen, and constantly in danger of being taken from her. This she knew, she said, from having overheard the servants and others conversing on the subject during the night. Aided by a good light, I carefully examined her. She had distortion of the muscles of the face, and a dribbling of saliva from the mouth. The right arm and leg were colder than the left, and had very little muscular power. There was scarcely any grasping power in the right hand. The head was hot, the face flushed, and the pulse feeble and quick. The radial arteries were hard and rigid under the ordinary pressure of the finger exerted in feeling the pulse. The tongue was dry and loaded. I was told that the bowels were confined, and that the urine was scanty. During her journey of thirty hours she had scarcely slept, had taken very little to eat or drink, and had all the time been more or less excited.

The immediate indications being to induce sleep, calm excitement, and support strength, I ordered some good soup with a little brandy to be given at once, and cold beef-tea abundantly during the night as a drink when she was awake. I also prescribed cold to the head, a mustard foot-bath, and a mixture containing fifteen grains of chloral and thirty grains of bromide of potassium and thirty drops of the Brit. Ph. solution of the hydrochlorate of morphia. One third of this mixture was ordered to be given every two hours, unless sleep were previously obtained.

It is here important to mention that the attendant assured me, in reply to repeated and variously put questions, that the patient had not exhibited difficulty in articulation, nor signs of paralysis of the face or limbs, up to the time of her leaving for Paris, and that neither symptom had been remarked till about an hour before I saw her. She admitted, however, that for a month or six weeks, the lady had been sleepless and troublesome at nights, sometimes violent and noisy, full of strange fancies, feeble in walking, and subject to a dribbling of saliva from the mouth.

On my visit next morning, about ten o'clock, I found that the patient had taken the whole of the calmative mixture, and that after the last third she had fallen into a quiet sleep of nearly two hours. She was calmer in manner, cooler in the head, less flushed in face. Her bowels had not been relieved. The urine passed was scanty and turbid. The hallucinations differed very little in character, though considerably in expression, from those of the previous evening. The baby was no longer with her in bed; it had, she said, been "taken out to the beach by the nurse." She apparently fancied herself in an hotel at Biarritz. She sometimes spoke of her husband as absent on a journey, and the next minute declared he was in an adjoining room. Her condition was that of excited bewilderment, which she herself admitted, explaining it by saying that she had been travelling so much and so rapidly for weeks past, and had been in such constant fear of her infant being stolen, that she hardly knew where she was or who she was. As there had been no alvine evacuation, I prescribed a cathartic draught, to be followed, if necessary, by an enema of an infusion of marsh mallows in three hours.

I returned in the afternoon. She had had an abundant stool; and was stated to have been much quieter since that occurrence. In other respects, she was very much as in the morning. I told her my name when she was addressing me as her husband. She at once said that she had seen me casually three or four years ago, when I was visiting a friend's child in consultation with another physician. She recounted the circumstances pretty accurately; and then suddenly relapsed into her bewilderment.

The dying condition of a near relation prevented any of the family coming to Paris. Under these circumstances, I was requested to act as I thought best. Accepting the responsibility, I asked Dr. Magnan to receive the lady into that department of his institution (Château de Suresnes) reserved for non-certificated patients; and on the evening of the day after the lady's arrival in Paris, she was installed at Suresnes, where I visited her from time to time in consultation with Dr. Magnan.

When the lady had been there three days, Dr. Magnan and I, by request, drew up an opinion of her case, which we transmitted to her family. I subjoin a copy of that document.

"We the undersigned Doctors of Medicine of the Faculty of Paris, met in consultation in the case of Miss A. B., having examined her condition with care, find that she is stricken with incomplete hemiplegia of the right side, accompanied by dementia.

"Miss A. B. has obviously enfeeblement of the intellectual faculties, with confusion and sometimes incoherence of ideas. She has periods of mental excitement, followed by periods of depression. Hallucinations, sometimes of a joyous and sometimes of a painful character, cause her to be at times restless, loquacious, and turbulent. These manifestations occur more frequently by night than by day; they are usually within moderate limits, and Miss A. B. is generally calmed by judicious intervention, and will often give correct answers to questions. From time to time she has attacks of giddiness, noises in the ears, with transient flushings and pallor of the countenance. Together with the occurrence of these symptoms, there is increased mental obtuseness, and sometimes drowsiness, and sometimes a kind of automatic excitement, during which she gets up, walks about without definite purpose, upsets everything, and is evidently not accountable for her actions. These apoplectiform phenomena are transient, and evidently depend upon derangement of the cerebral circulation arising from congestion or ischæmia.

"Miss A. B. has intervals of nearly perfect lucidity, during which, however, we can recognise an impaired mental condition, unaccompanied by delirium. At times she knows what is going on around her, and takes a correct view of the same.

"The derangement of her physical is as obvious as the derangement of her mental state. Her gait is unsteady, and she cannot walk without leaning on some one or on a stick. Her speech is slightly thick. The right arm and leg are the most feeble. Miss A. B.'s general health is much at fault; her appetite is indifferent; her gums are spongy and bluish;

her digestion is feeble; her extremities are cold, and her ankles are swollen; the skin is dry, and acts badly. The urine, tested by heat and nitric acid, and by Barwell's solution, gives no indication of albumen or sugar. The arteries at the wrists are rigid. The pulsations of the heart are regular; at the apex, accompanying the first sound, a slight blowing is heard.

"The group of symptoms now described—namely, incipient dementia, transient phases of excitement and depression, apoplectiform phenomena, and incomplete hemiplegia of the right side—lead us to conclude that there is a a general lesion dependent on an atheromatous state of the cerebral vessels, and having as its proximate cause a circumscribed lesion—hæmorrhage or softening in the left *corps opto-strié*.

"The prognosis is unfavourable, not only on account of the existing cerebral lesion and the anxious state of Miss A. B.'s physical health, but likewise on account of the possible production or present existence of cerebral hæmorrhage or softening.

"JOHN ROSE CORMACK.
"MAGNAN."

Weeks elapsed after our opinion was drawn up before the complete materials were received from which the subjoined medical history of the patient is derived. The narrative is simplified by introducing this history before proceeding with the progress of the case from the date of its reception into Dr. Magnan's house.

Miss A. B., till recent years, throughout life, enjoyed good health, her only trouble having been a tendency to constipation. Five years prior to her illness in 1875, the menstrual function ceased suddenly without deteriorating the health or causing any inconvenience. About a year after the menopause, she suffered severely from an eruption, which extended over the lower half of the body, and was stated by her medical attendant to be of an eczematous nature. Since that date she has had several attacks of urticaria.

In May or June, 1873, whilst at Schwalbach, she first manifested undue excitement and had hallucinations. For these symptoms she was medically treated. In July, 1874, when at the baths of Ragatz, the symptoms recurred. At that time Miss A. B. managed to elude the observation of her family, and to get away from her home. Two days elapsed before any trace of her was obtained. She was found in an hotel near Zürich. Her peculiar behaviour, and the fact of her arriving without any luggage, excited the suspicions of the landlord, who detained her. She was brought back, as soon as she was found, to Ragatz, where she was treated, in the first instance with bromide of potassium, and afterwards with vegetable tonics. She seems to have soon regained her health, and to have then gone to England. In November she returned to the Continent. Her ailments, if any existed, did not attract notice from that date till January 14th, 1875, when she was at Mentone. Dr. Siordet was called in on the 17th January. That physician, in answer to my inquiries as to some points in the history of the case, wrote me a very interesting letter regarding it, on March 29, 1875, from which, in continuation of the narrative, I make an extract.

"I first saw her professionally," writes Dr. Siordet, "on January 17th. I was then told that she had been out of sorts for a day or two. On the previous night she had maintained that there were some armed men concealed in the hotel for the purpose of murdering her and her friends. Under the influence of this delusion she refused to go to bed, went into the bedroom of one of her friends, and there crouched under the bed. I found her dressed, sitting at an open window, the outer jalousies of which were closed. She complained of pain at the top of her head, to which situation she had applied rags soaked in cold water. Her eyes were congested, and her tongue furred. Her articulation was slow, but she conversed in a perfectly rational manner regarding her alarms and fancies of the previous night. She could take no solid food, having a repugnance to it. I prescribed bromide of potassium in repeated doses, and the compound power of jalap as a purgative. As it was very desirable that no one in the hotel should be disturbed, I also prescribed thirty grains of hydrate of chloral to be taken at bedtime. Next day I found the patient suffering less pain, and decidedly better: she had slept several hours.

"She gradually improved. The chloral was taken for two or three nights only. The bromide was gradually decreased, till finally it was given only three times in the twenty-four hours. One of the three doses, given at bedtime, induced sleep. Chicken, subsequently mutton-chops, were eaten at midday. On January 20th and 21st, Miss A. B. was able to drive out in an open carriage. On the 22nd I found her quite convalescent, suffering only from weakness, which was indicated by her languid manner. I nevertheless feared a return of the hallucinations, and began to have misgivings as to the issue of the case.

"Early in February she wrote a letter to ——, which betrayed no illness nor failure of mental power. Before Lent she attended a fancy ball at the Hôtel des Anglais. Soon after this her symptoms increased in severity in a very marked manner, the hallucinations being chiefly towards evening. She now became completely insane, and daily lost strength. A special female attendant was engaged, under whose charge she was sent to Paris."

During the two or three weeks which immediately preceded her coming to Paris to be under my care, Miss A. B. was seen by the late Professor John Hughes Bennett, then resident at Nice, and by another English physician who happened to be at the hotel when the patient was at her worst, just before her departure for Paris. From letters now before me, I gather that both of these physicians looked upon the case as likely to prove one of general paralysis. Their diagnosis and prognosis were very similar to those afterwards arrived at by Dr. Magnan and myself. Fortunately, we were all in error in our gloomy foreshadowing of the issue.

The treatment of the case was regulated by Dr. Magnan and myself in frequent consultations, and was skilfully and watchfully carried out by Dr. Magnan and his colleagues, Drs. Bouchereau and Lolliot, at the Château de Suresnes, where the patients—lunatic and non-lunatic—have, besides the medical treatment suited to their various necessities, the auxiliary advantages of domestic comfort and an extensive surrounding of beautiful groves and gardens for exercise and solace.

Our first object in the medical treatment was to produce resolution of the circumscribed cerebral lesion and its surrounding hyperæmia. With this view we prescribed 150 centigrammes of iodide of potassium to be taken in the twenty-four hours. We also prescribed the employment of aloes pills to the extent requisite to keep the bowels open and induce revulsive action in the pelvic organs and hæmorrhoidal vessels. We also agreed that the patient should take an alkaline general warm bath every third day, and a mustard foot-bath every second night immediately before going to bed. We decided that the diet should be varied in kind and sustaining in its nature, consisting of meat-broth, pounded raw meat, roast meat, fresh vegetables, and a moderate allowance of sherry wine.

From the 15th to the 30th March no notable change occurred in the patient's intellectual state: the mental faculties remained obtunded. Miss A. B. had occasional fits of automatic movements; she went hither and thither without knowing what she was doing. Sometimes the agitation was caused by various delusions and hallucinations. She continued, for example, to imagine that she was a married woman, and fancied she heard the voices of her husband and children calling her. Several times during the night she endeavoured to leave her bed to go to them. She would at other times clasp her pillow in her arms, caress it, and talk to it in endearing language, as if it were her infant son. When abruptly addressed in an authoritative tone, her mind for a few minutes often seemed to become much more lucid, as was evinced by the tolerably correct answers she then gave to the questions addressed to her. When let alone, after having been interrogated in the way described, she soon relapsed into incoherence and bewilderment.

During the same period—that is, between March 15th and 30th—the general health improved. The gums became less spongy. The patient either swallowed or ejected the saliva: it no longer collected in her mouth and dribbled down on her chin and breast. Her appetite was improved. After a period of alternations of diarrhœa and constipation, digestion proceeded in a more normal manner, and the involuntary alvine and vesical evacuations became more and more rare. Her walk became less shuffling, and she raised the right foot better from the ground.

Towards the end of March, a furuncular eruption was visible on the chest, hips, and thighs, as well as on other parts of the body, and ultimately an enormous carbuncle appeared at the nape of the neck. At this period, the urine was repeatedly tested for sugar and albumen, without either being found. During April, the furnuncular eruption continued : some of the boils suppurated and healed, whilst others, their successors, appeared in the neighbourhood. The carbuncle was treated by free incisions, followed by opiated bread-and-milk poultices.

Towards the end of April, Miss A. B.'s intelligence began to awake; her hallucinations were less frequent; she isolated herself less, and did not seek seclusion so much as she had done; she conversed more willingly—followed better a train of ideas—and showed interest and pleasure in the society of those by whom she was surrounded. She asked me many questions of a very natural and proper kind about her friends; and proposed to draw a cheque that I might get money for her to pay her current expenses. Her mind was still at times confused, and occupied with her imaginary approaching marriage. Her husband and infant son seemed at this period to have faded away; and in their room was installed an imaginary lover to whom she fancied she was betrothed. She repeatedly asked permission to take a railway-ticket that she might go to him. This confused matrimonial delusion was not constant; it seemed to come over her with a bewildering excitement once or twice, for a short time, in the twenty-four hours, and then to cease, or to become so mild as not to attract notice.

She now had better nights: her sleeps were longer and calmer. The muscular debility left her: without fatigue, and with a keen sense of enjoyment, she walked for hours daily in the grounds attached to the institution. Occasionally, she took carriage exercise in the neighbouring Bois de Boulogne.

Up to April 25th, she had a weekly alcaline bath. To the same date, the iodide of potassium and aloes were continued. During the first fifteen days of May, she took an infusion of quassia mixed with her claret at meals. During this period she also took arseniate of soda in daily doses of five milligrammes. From May 15th her improvement was rapid, both in respect to mind and body. Her appetite was good, and from day to day she regained flesh and strength.

During the latter half of May, hardly a vestige of her former delusions could be detected; there was more and more precision in her ideas; her memory became more and more accurate. She began to consider the situation in which she was placed; and received the visits of her relations, with whom she conversed intelligently and discreetly regarding her pecuniary arrangements and future plans. In the many conversations which I had with her during this fortnight, I failed to detect any delusions or hallucinations. The resident physicians, however, observed at times a recurrence, in a very modified form, of some of her hallucinations; but it was perceived that she was always able to recognise and dismiss them. She had also occasional transient delusions, residuary morbid phenomena pertaining to the morbid mental state from which she had emerged, and in which she admitted she had been on her arrival in Paris.

On May 23rd, I had a long conversation with her regarding her late illness and her then state of health. She urged upon me, as she had on previous occasions, the importance, on account of family affairs, of her leaving the institution in a day or two, and she likewise represented that her physical and her mental state were now quite sound, and did not justify separation from her family; but still, she said, that if I thought a few weeks longer were required to confirm her cure, she would consent to remain.

On May 31st, she drove with me from Suresnes to her banker's and to several shops, and then, accompanied by her maid-servant (who had not been in the asylum with her) left in the evening for Brighton, which she reached next morning without experiencing the least fatigue. To prove that I had done right in sanctioning her journey, she wrote to me, a few hours after her arrival, giving a short account of her comfortable state on the way, and expressing herself very nicely and gratefully for the kindness she had received from Dr. Magnan, his wife, and myself.

In October, 1875—more than four months after the patient left Dr. Magnan's house—I had the great pleasure of seeing her in Paris in perfect health of mind and body. She was then travelling with a family party to winter quarters in the South of France. I have since that time heard of her occasionally, and up to this date (July 26th, 1876) I have ascertained that her health and state of mind have not given any anxiety to herself or others.

The issue of this case may, I think, be correctly called *recovery*—recovery from the disease, the predisposition of course remaining. There was observed in this case a state of the arteries which probably led to the effusion of blood and the consequent symptoms; and from the same state of the arteries we may almost expect the occurrence of an attack, or attacks, more or less similar to the first. In of the case is not lessened by admitting this pr

The symptoms, progress, and issue of this c
conclusion that there existed congestion of t
striatum and optic thalamus prior to and a
the lady's arrival in Paris on March 12th,
the manner in which the symptoms gradu
and finally disappeared, we cannot suppose tha
referred to, or afterwards, there was any disc
cerebral tissue. Most probably the symptoms
congestion occasioned by extravasated blood,
bably their disappearance depended on the abs
blood. Any conditions which occasion co
similar situation in the brain will, no doubt
similar symptoms, which symptoms will ceas
gestion ceasing, provided always there be no
condition except congestion.

Physicians very seldom have an opportuni
cases of the general paralysis of insanity, or, ind
of mental unsoundness, in the incipient, or eve
stage. This arises from two causes—*first*,
occult manner in which cerebral disease begins
the jealous care with which the patients then
and still oftener their near relatives, strive to

nings. In the incipient and most hopeful stage nothing was done; and treatment was not resorted to till the seclusion of an asylum had become a necessity. My experience in this matter—being also, I believe, the experience of the whole medical profession—sufficiently explains to my mind the prevalent belief that general paralysis is incurable. No doubt, among the cases admitted to asylums there are few real recoveries, and long intermissions equivalent to recoveries are also rare, though sufficiently frequent to have excited the particular attention of psychologists. On the other hand, it has been said that the majority of the cases supposed to have been successfully treated in private practice, however much they may have simulated the early stage of general paralysis, were proved by the very fact of recovery not to have been really cases of that disease. This objection has no practical importance, for it leaves uncontradicted the act that cases which no diagnostic rules hitherto discovered can distinguish from general paralysis in an early stage are cured both in and outside lunatic asylums. It appears also that the recoveries and intermissions are so often coincident with derivation and counter-irritation instituted by nature that we are constrained to ask whether these may not be curative causes. Did the angry carbuncle in the case of Miss A. B. exert a beneficial influence? An examination of Baillarger's series of cases already mentioned induces me to answer this question in the affirmative. I invite my readers to make this examination for themselves, as a critical analysis of these cases would here occupy too much space.

The first case in Baillarger's series is a typical example of the class to which it belongs, both in respect to symptoms and the unexpected recovery. The following is a summary of the leading features of this remarkable case:[1]

The patient was a working man—a dyer, of Nancy—who, after being the subject of melancholia, had an attack of mania. When admitted, under the care of Morel, he was in a state of great excitement. The existence of grandeur-delirium rendered the prognosis very unfavorable, particularly from its being associated with a great hesitation in speech, and so much debility in the lower extremities as to cause the patient to reel like a drunken man. For seven months he exhibited all the phases of general paralysis, and at last his state of exhaustion and marasmus was such as to confine him to his bed. Under these circumstances an abscess of the liver declared itself, which, the first time it was punctured, yielded more than a *litre* of pus, and continued to discharge enormously for fifteen days by the opening which was maintained. His condition was such that death appeared imminent. However, twenty days after he was confined to bed, the fever moderated, strength returned, and he ceased to rave about his grandeur; he was no longer Napoleon, distributing honours and places of command. He conversed with his family in a reasonable manner. His difficulty of speech went on diminishing, till it finally ceased.

On leaving the hospital after an eight months' residence he was not only able to resume his work as a dyer at Nancy, but soon afterwards removed to Paris, where he had carried on his business in a large way for three years (when the case was published) without the slightest *return of the paralysis or other associated* morbid condition.

"This case," to quote the remarks of Baillarger, "is a most remarkable example of the cure of general paralysis. The patient not only had every characteristic symptom of that disease, but had fallen into a state of marasmus, and was apparently doomed to die very soon. These were his conditions when recovery took place—*evidently under the influence of a large abscess in the region of the liver.* It appears, then, that the most formidable symptoms of general paralysis may exist without disorganisation of the nervous tubes, without softening of the cortical substance of the brain, and, in fact, without any other morbid condition than a state of congestion, still curable under the influence of powerful derivation such as was produced by the hepatic abscess. Let it be remarked that the patient who made this unexpected recovery was the subject of great excitement and of ambitious delirium of a violent character. Let it also be remarked that this maniacal attack was preceded by melancholia, as happens in many cases."

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[1] The case was originally published by Morel at p. 388 of the *Annales Médico-Psychologiques* for 1858.

Whether we hold with some authors, that the first stage of general paralysis is one of simple congestion; with others, that it is a chronic congestion accompanied by exudation; or with others, that it is a true inflammation—a periencephalitis—we must admit that there is a first stage of greater or less duration, in which *cures*, or, as some put it, very long *remissions* or *retardations*, have taken place under spontaneously established derivative influences, and under similar influences produced by the therapeutic art. We have manifestations like those described as pathognomonic of general paralysis likewise arising from hæmorrhage, thrombosis, and embolism. Cures are far more likely to take place when the cause is hæmorrhage, than when it is thrombosis or embolism. A clot may be absorbed without any destruction of brain-tissue having taken place from the pressure which it caused; but when vessels are stopped, anæmia, imperfect nutrition of part of the brain and consequent softening are the results. In Miss A. B. there existed, we suppose, congestion and a clot; but neither an embolus nor hardening, softening, nor other change of cerebral tissue.

Dismissing, for the present, questions of differential diagnosis and pathological difficulty, it appears that we may unhesitatingly adopt a clear rule of practice from the facts now stated, and from many others of similar import which might be adduced. When called to a patient whose ways and utterances are said to have become peculiar, whose mind is more or less excited, whose gait is dragging and unsteady, whose speech is hesitating, and whose pupils are unequal, or who, without having all, has some of these symptoms, we ought to institute a treatment having for its principal aim the relief of cerebral congestion. For that purpose we must not only prescribe a bromide, and resort to the usual measures to promote the healthful action of the skin, stomach, liver, and kidneys; but we must likewise maintain powerful derivation by purgatives and by various other means, such as issues, open blisters, and tartar emetic ointment. By such means, if summoned sufficiently early, we may perhaps cure patients who would have drifted down into the hopeless depths of general paralysis, or of some other form of brain disease.

Could early and later guidance, combined with suitable medical treatment, have saved the subject of the following history?

CASE OF ROBERT JAMES T.—*General Paralysis with Insanity: Preponderance of Spinal Symptoms: Autopsy.*

On the 15th January, 1876, my friend, Dr. Carles, of Neuilly, asked me to receive one of his poor patients, a much afflicted Scottish gentleman, into the Hertford British Hospital. Though able to pay moderately for medical aid in an ordinary illness, his resources, much diminished by his protracted malady, were inadequate to meet the expenses which had become necessary for constant medical and other attendance. Night and day he required to be watched and helped. He had from time to time to be kept in bed by forcible means: he required the assistance of two persons when the wants of nature were being relieved: and he had to be fed, as he could not guide his hands to his mouth.

In consideration of the circumstances now stated, he was received as a resident patient.

Robert James T., aged 34, the wreck of a man who still had remains of former fine looks, the subject of the following history, was admitted on the 15th, and died in the hospital on the 30th January, 1876.

The history of the patient's case was derived chiefly from his wife. For some additional facts, I am indebted to Dr. Carles.

The father and mother of the patient were Scotch; and he was born in Scotland in 1842. His father was a prosperous farmer, and a man of considerable mental culture. From an early age, the patient appears to have exhibited refined tastes. He devoted his spare time to music, literature, and the natural sciences, showing more liking and aptitude for these pursuits and for field sports than for the study of the profession of agriculture for which he was trained. Long before suspicion had been excited in his family as to the soundness of his bodily and mental state, he was noted as being reckless in spending money. This peculiarity, at first regarded as a fault, gradually became developed into a morbid passion for making purchases of music, books, and pictures, and many things which he had no need of, or could not afford to buy. With the expectation of greatly increasing his means, he relinquished agriculture, and joined a relative in a commercial business in London, a step which proved financially disastrous. This caused him to retire from business. He wound up his commercial affairs at a great loss six months after his marriage, and came to reside in Paris.

Up to the year 1872, that is, till he attained the age or thirty, notwithstanding his pecuniary recklessness, nothing was supposed to be wrong with his mind. It was in August of that year that he married. His wife says that he was at that date a fine-looking man, temperate in his habits, strong, and healthy ; but that very soon afterwards, his health began to fail. Six months after marriage, he was seized with fits of trembling of the superior extremities, which recurred frequently for about a week. From that time he was an altered man, and his natural money-spending became exaggerated into a real mania. He wasted all the money he could lay his hands upon in buying unnecessary articles at exorbitant prices—particularly expensive books and valueless pictures.

Such was the nature of the patient's mental disorder during the first year of his married life. At first, being moderate in degree, it was not very observable; but it soon became painfully obvious to his wife and others; and it went on steadily increasing.

About twelve months after marriage, he began to have attacks of general trembling. During these attacks his whole body shook violently as if he were stricken with pyæmia or passing through the cold stage of a severe paroxysm of intermittent fever. On the subsidence of the paroxysm, he always complained of feeling weak, and had a tired appearance. He walked out unattended at this period, though his gait was unsteady and his extravagant expenditure of money was a constant cause of anxiety and difficulty. His choice of pastimes showed the pleasure he had in listening to beautiful music and contemplating works of high art, sources whence, from boyhood upwards, he had been in the habit of deriving great enjoyment. He often visited the gardens of the Tuileries and of the Palais Royal, when the bands were playing; and he used frequently to spend hours at a time in the Louvre galleries of painting and sculpture. During this period—the second year of his married life, when resident in Paris—several physicians of repute and skill were consulted in his case. They seem to have agreed in stating that there was no hope of curing the patient, but that the symptoms might be alleviated, and that the progress of the malady might be retarded by judicious treatment. So far as can now be ascertained, the principal therapeutic measures recommended were quietude, tepid shower baths, and saline purgatives. The patient, however, and also his wife, were of opinion that benefit was likely to be obtained by travelling and by drinking mineral waters. Under this impression, they left Paris for some months, without any definite plan, seeking amusement and a cure at a succession of watering-places.

On their return to Paris, the patient's symptoms remained much as when he started on the tour, with two important exceptions—that he was more excitable, and less tolerant of the ordinary street-noises. The rumbling of the carriages greatly agitated him. Under these circumstances, he left his house in the centre of Paris and entered a private hospital (*maison de santé*) in a quiet suburb. There he had shower-baths, Turkish baths, and variously medicated baths. After a residence of six weeks he returned home in a worse state than when he went. It was remarked at this time that he took his meals with keen enjoyment, and digested his food. To be at home, and also out of the noise of Paris, he rented an apartment at Neuilly for himself and his wife.

In succession, different physicians, druggists, and charlatans were now consulted, the downward course of the patient continuing under all the varieties and eccentricities of treatment which were tried. Among those who inspired temporary hopes was a "guérisseur," a swindler of the worst type. He offered to contract for a cure in three years, at the rate of five thousand francs (£200) a year, payable in advance by quarterly instalments. The offer was accepted, but was soon repudiated, the grossness of the imposture having been suspected. The treatment—which had been commenced by the application of the actual cautery along the spine—was discontinued. The "guérisseur," having threatened to enforce his contract by legal process, succeeded in extorting money as a compromise of his claim, which had it been investigated in a court of law would certainly have sent him into penal servitude.

Soon after the application of the actual cautery, but I do *not* suppose in consequence of it, the fits of trembling increased in severity and in frequency. By this time, the patient had nearly lost the power of writing which had been impaired and was steadily decreasing from the first observed manifestation of unfavorable symptoms. He could not even sign his name unless his hand were guided. I have seen some of his attempts at penmanship at this period, and contrasted them with his handwriting before his breakdown in health. Before his illness he wrote fluently, legibly, and fairly well. His later attempts exactly resembled the slow, unsteady performance of a child to whom the formation of each individual letter was a difficult labour. I have now before me the Lord's Prayer written by him in this infantile manner. When in this stage of his malady, endeavouring to write was one of his favourite pastimes. He began at this time to have intermittent attacks of stammering, and of nearly inarticulate speech. There were considerable intervals, however, during which his articulation was either perfectly distinct or only slightly and transiently affected.

For seven or eight months before admission to the Hertford British Hospital, he was not allowed to walk out alone. Upon one occasion, however, about seven months before admission, he left home, unobserved, during his wife's temporary absence. After having been lost for some hours, he was found by his wife at a police-office where he had been lodged as an insane person. He remained speechless at the police-office for some hours; but his wife states, that on seeing her enter, he spoke with great volubility, though his words were not distinctly articulated. He had no recollection of having been conveyed to the police-office, nor of the circumstances which immediately preceded that occurrence. It seems pretty certain that when taken into custody he was in a state of stupor. He evidently satisfied the authorities that he was not insane in their acceptation of the term. On coming out of his stupor, he asked his custodiers at the police-office for food, which was at once supplied. After satisfying the cravings of hunger, he proposed to his wife that they should return together to their home. When his position was explained to him, and he was told that he could not be released till the morning, he calmly requested sheets and a pillow, which were granted. Next morning he returned home in perfect good humour with himself and everybody. On the same day, he occupied himself by playing on the harmonium, reading, and trying to write.

Early in August, 1875—seven months before admission—the increased severity of the manifestations of his disease became alarming. His speech was wholly unintelligible, except to his wife and one or two others who were much with him; and even by them, a few words only were really recognised—the meaning of his sentences being to a great extent derived from his looks and gestures. His movements became every day more and more difficult. To enable him to move from one chair to another—a distance of three or four feet—he had to be supported. It was about this period—August, 1875—that he gradually lost the power of the sphincters. At first, he had a few seconds' notice of the call to urinate or defecate; and if immediate help were at hand, he was often saved from disagreeable consequences.

From this time up to admission, his condition became worse; but, belonging to this period, there are very few incidents of importance to report in the progress of his *bodily* and mental deterioration.

A few days before admission, he was found in a state of unconsciousness, no doubt the result of cerebral congestion. He remained in this state for two hours. Dr. Carles, then in regular attendance, recommended, for reasons already mentioned, that I should be asked to receive him into the hospital.

On admission at 4 P.M., on January 15th, 1876, he was received by Mr. J. Hocart, temporary Resident Clinical Assistant, who entered the following note:—"He was carried into the ward in a helpless state by four men. He seemed a tall strong-looking man of beautiful muscular build, and handsome face marked with a look of terror. His forehead and face were streaming with perspiration. At first, it was impossible to understand his attempts at articulate speech, but in half an hour the monosyllables *yes* and *no* were recognised. Soon after he was laid in bed, his features relaxed into a pleasant expression, clearly indicating satisfaction with his change of quarters."

I arrived at the hospital at half past 5 P.M., when I met Dr. Carles by appointment. Together with him, I made a very minute examination of the case. It is not necessary, however, to reproduce here the entries then made, much of the information elicited being contained in the history of the case as already detailed.

As soon as the patient saw Dr. Carles, he cordially shook hands with him; and when the doctor introduced me, I at once received a similarly gracious and energetic salutation.

He moved his arms to a considerable extent in accordance with his volition: but there were some movements with them which he could not accomplish or reg

Both deltoids seemed to be almost powerless. There was no loss of power in the lower extremities. The cutaneous sensibility was very feeble everywhere, but particularly in the lower extremities. In the course of my conversation at the bedside with Dr. Carles and the patient's wife, a circumstance was mentioned which led me to remark that the patient belonged to a family in Scotland known to me, and which had given a worthy member to the medical profession. No sooner had I made this statement, than the patient took hold of me by the hand and repeated the hearty shake already described, looking imploringly at the same time at his wife, and making an effort to speak. His attempts at articulation failed; but by noises, signs, and gestures he made his wife tell me that the gentleman whose name I had mentioned was his uncle. When this statement was made he seemed greatly pleased and again shook hands with me—shaking hands being evidently his part in a conversation into which he fully entered, but in which he could not participate by speech. I went on to say that I knew his uncle to have been the friend of a lately deceased eminent Scottish physician, the late Sir James Y. Simpson, with whom, I said, I had been intimately acquainted from my student days onward. In response to this announcement, the hand-shaking was energetically renewed and was accompanied by a fit of convulsive smiles.

I was told that till two days before admission, he had taken food heartily, but that now his appetite had failed, and he had some nausea with attempts to vomit. In consequence of this report, and from his having had no stool for two days, a dose of calomel and rhubarb was ordered. He was put on the ordinary liquid nutritious diet of the hospital.

January 16th.—He has passed involuntarily a considerable quantity of urine. As the bowels were not moved by the calomel and rhubarb, three tumblers of Pullna water were administered at intervals during the day. Soon after the last tumbler, he passed a scanty stool involuntarily, but not unconsciously. During the whole of this day, he had nausea and profuse sweating.

January 17*th.*—Very little urine and only one scanty stool have been passed since admission. He can retain only exceedingly small quantities of food; and consequently he gets only one or two teaspoonfuls of beef-tea or thin arrowroot at a time.

January 18*th.*—The face, shoulders, and chest are covered with sudamina. In the evening when I saw him, about 8 o'clock, he was decidedly much worse than he had yet been. He was sweating and trembling violently. Before I left the hospital, his bowels were copiously relieved by an enema, after which his appearance improved. As he had been very restless and sleepless since admission, I prescribed a mixture containing twenty grains of bromide of potassium and ten grains of hydrate of chloral—one half of which mixture was to be taken immediately and the other half in two hours if he were awake and restless. I also ordered a large blister to be applied to the nape of the neck.

January 19*th.*—The blister rose well. He slept the greater part of the night; has taken food well to-day; and has seemed more comfortable than hitherto.

January 22*nd.*—Till late last night, yesterday and the previous day were days of great restlessness, discomfort, and frequent fits of trembling. Since the night of the blister, till last night, he had not slept, though on each night he had the same quantity of bromide of potassium and chloral administered *as on that* occasion. About midnight, he revi in strength and remarkably brightened in manner. He took food eagerly—assisted the nurses in changing his sheets and shirt—and made attempts to articulate, which were more successful than any he had made since admission, a number of his words being understood. He moved about his arms a great deal. He fell quietly asleep after this exertion, but woke soon, sweating profusely, and in an excited state. He tried to tear off his night shirt, and nearly contrived to get out of bed. His pulse is slow, thready, and intermittent. Hitherto it has been slow—from 50 to 64—but never so weak and intermittent as at present.

January 23rd.—His state is much the same as yesterday. The bowels have been moderately moved by a tablespoonful of castor oil followed by an enema. He refuses food. During the night, the nurse states that he had short paroxysms of dyspnœa, and also, at intervals, attacks of severe pain.

January 24th.—When Mr. J. Hocart went into the ward this morning about eight o'clock he was told by the nurse that the patient was able to speak, a statement promptly verified by the patient articulating several sentences sufficiently well to be understood. Later in the day, when I made my ordinary visit, speech was more distinct than I had yet found it—but was stated to be less distinct than during the early part of the morning. During the day he took a good deal of food, and had several apparently comfortable snatches of sleep of from ten minutes to half an hour.

January 25th.—Since yesterday his speech has been throughout fairly intelligible, but not uniformly distinct.

January 26th and *27th.*—His speech became more and more distinct. Along with this change, his weakness increased. On the evening of the 27th, he asked eagerly for food, and complained of being starved. After an egg-flip, he said he was "better."

January 28*th* and 29*th*.—He spoke once or twice, but much less intelligibly than on the two or three previous days. He took—but unwillingly—a little food. He was steadily sinking; and during the evening of the 29th he was supposed to be at his very last.

January 30*th*.—I was surprised to find him living when I made my ordinary visit at eleven in the forenoon. He was excessively weak, but conscious of all that was going on around him—shook hands with me several times—and even answered inquiries in short articulate sentences. To my question:—"How are you to-day?" he replied "Am better;" and when I said:—"Have you slept?" his answer was "Not much." During yesterday and to-day he has repeatedly appeared to be absorbed in earnest prayer, joining his hands, as if in supplication and silently moving his lips. He died at 10 p.m., having, in his usual way, a very short time before taking his last breath, cordially shaken hands with his wife, Mr. J. Hocart, and the night-nurse.

AUTOPSY.—Sixty hours after death I made an examination of the body, assisted by Dr. Carles and Mr. J. Hocart.

The view of the body externally was not calculated to suggest to the observer that the deceased had succumbed under the influence of severe or protracted disease. The face, trunk, and extremities were those of a well-nourished subject.

The cranium and its contents were first examined.

The bones of the cranium were very hard and much thickened. The spongy portion of the bones which had nearly disappeared was replaced by a compact tissue. Though this change was everywhere visible, it w strikingly exhibited in the frontal and parietal bones. The internal surface of all the cranial bones was in a state of congestion. This congestion was greatest on the inner surface of the left parietal bone.

On opening the head, serosity was collected, which weighed 200 grammes—equal by measure to six ounces and seven drachms of British Apothecaries' weight.

The weight of the encephalon, exclusive of the fluid, was 1,100 grammes, the brain weighing 920 grammes, and the cerebellum 180 grammes. The left hemisphere of the brain weighed 470 grammes, and the right weighed 20 grammes less.

The dura mater was thickened. It adhered to the arachnoid, to the pia mater, and to the cortical cerebral substance at two corresponding points of the longitudinal convolutions near the median line, the adhesions being stronger towards the left. The right frontal lobe was attached to the membranes by strong adhesions. The third right convolution was softened and friable, and presented a clot, the size of a filbert nut, of extravasated blood.

The cortical substance, at the anterior edge of the first frontal convolution of the same side, was pultaceous. In the left hemisphere, similar adhesions were observed at the inner edge of the third frontal convolution, and generally on the upper surface of the left frontal lobe. At the third convolution, the adhesions were so strong that the membranes could not be separated from the cortical substance. The same lobe presented points where softening was observed. In the first convolution of the same frontal lobe, there were several clots.

The *cerebellum* presented an appearance of moderate *hyperæmia* in the grey substance.

There was softening of the *spinal cord* extending from the olivary bodies to the cervical region. The cauda equina was slightly hyperæmic.

Thorax.—The *lungs* were healthy. The right lung weighed 775 grammes and the left weighed 655 grammes. At the summit of the right lung, there were some slight adhesions. The *heart*, which weighed 320 grammes, was in all respects normal.

Abdomen and Pelvis.—The *liver* weighed 1,580 grammes. It was considerably congested; and when pressed exuded black blood. The gall-bladder was unusually large; and was distended with a greenish-black fluid of the consistence of syrup. The *spleen* was very small, and so shrivelled up as to look like a dried apple. It weighed 195 grammes and was of a violet colour. The *kidneys* and *bladder* were in a normal condition. The right kidney weighed 120 grammes, and the left 155 grammes. The bladder was empty. The *pancreas*, *stomach*, and *intestines* were in a normal state.

In the case of Robert James T., marriage accelerated the evolution of the malady. Before marriage, however, the oddities and eccentricities of very early life were becoming developed into insanity under the influence of various favouring conditions.

In another case to be now narrated, marriage also stimulated the evolution of the mental disease and the associated paralysis; it determined the culmination of a ripe catastrophe, which no measures could have long averted. In point of fact, marriage was an outcome of the [illegible]ed disease, as well the cause of its more rapid evolu

CASE OF MR. S. H. T.:—*General Paralysis with Insanity.*

At 2 A.M. on the 17th October, 1874, my professional services were urgently requested on behalf of Mr. S. H. T. under extraordinary and painful circumstances. Two ladies, near relations of the patient, came to fetch me, that they might put me in possession of the principal facts, before I reached the scene of anxiety and disorder. One of the ladies had her head and face bandaged in consequence of severe blows inflicted some hours previously by the patient, who I was told was, at the time I was summoned, in a state of violent excitement, which had necessitated two men being called in for the protection of the household. This excitement was attributed to daily alcoholic excesses, which had continued from the day of his marriage, an event which had taken place about three weeks previously. I prescribed; and promised to see the patient within three or four hours. On arriving at 7 a.m., I found that he had become quieter for the last hour, the comparative calm being evidently the result of the draught which I had prescribed. I knocked at the door of the bed-room where I was told he was preparing to go to bed. He at once invited me to come in. He was standing naked in the middle of the floor smoking a cigar, the room being exposed to view from the street by two open casement windows. On a table were cigars, wine, brandy, and tumblers. He did not show surprise at my visit, and after cordially shaking hands, he offered me a cigar and a tumbler of brandy and water, both of which I accepted. When I said, that being afraid of sore-throat, I must be allowed to close the windows, he at once replied—"by all means shut the windows." On my expressing *surprise* at his not being afraid of catching cold, he replied that cold and heat were alike incapable of injuring him—that he was different in that respect, and indeed in all respects from other men—that the temperature of an ice-house or a furnace suited him equally well. I then suggested that as there were ladies in the house who might at any moment join us, he had better put on his shirt and dressing-gown. He said that since the marriage of Queen Victoria, no bridegroom of exalted rank had ever worn shirt or other garment from the time of undressing at night till the time of dressing in the morning; and that he must not act differently from men of his class. After a few minutes he became noisy, and took constant sips of wine and brandy. I was able to write a prescription as he complained of diarrhœa. I thus obtained in a short time from a neighbouring apothecary, a mixture containing thirty grains of hydrate of chloral, thirty grains of bromide of potassium, and one drachm of the Br. Ph. solution of the hydrochlorate of morphia, of which I forthwith administered one half. In about twenty minutes he seemed drowsy, staggered towards his bed, and, accepting my assistance, lay down on it. I left him sleeping, having given my instructions that if his sleep was only snatchy and imperfect the other half of the potion was to be administered. I also strictly interdicted brandy and all stimulants. I stated to the family that as the symptoms were not only exceedingly urgent, but as they suggested something more than mere alcoholism, I wished a consultation with another physician before settling how and where he ought to be treated. This was agreed to; and I was requested to arrange a meeting with Dr. Blanche.

I returned at 10 o'clock. The drowsy drugs h
him some refreshing sleep. He had taken the

of the potion, and had soon afterwards fallen into a rather quiet sleep which lasted for nearly an hour. On awaking he took some coffee and some bread—immediately ordered a carriage for the day—and commanded his wife and one of the ladies of the house to get ready to go out with him as he required their assistance in making purchases. The party had just left the house; and no one could give me the least idea when they were likely to return. I returned at 1 o'clock; but as nothing had then been heard of the purchasers, I left, intimating that I proposed to return at 5 o'clock, the time which Dr. Blanche and I had fixed for the consultation. At our consultation, we drew up a certificate, by which we legalised the immediate removal of Mr. S. H. T. to an asylum.[1]

The continuity of the narrative will not be interrupted by here introducing the report on the case which Dr. Blanche and I drew up on the 31st October, as it contains a summary of our interview with the patient on the evening of the 17th as well as of all the principal facts of the case from that day to the 31st October. I did not see him on the 18th; but I visited him on the 19th and daily till the 31st, when after a long interview with the physician of the asylum in which Mr. S. H. T. was placed, the subjoined document was drawn up for the family by Dr. Blanche and me.

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[1] COPY OF CERTIFICATE.—"Paris: le 17 Octobre, 1874.—Nous soussignés, docteurs en médecine de la Faculté de Paris, certifions que Monsieur S. H. T., age 39, * * * demeurant habituellement à * * * *, arrivé depuis hier à Paris, où il est descendu Avenue * * * *, No. * * est dans un état d'excitation maniaque qui lui fait commetre des actes insensés et dangereux. Il a fait hier et aujourd'hui des achats pour des sommes considérables (plux de dix mille livres sterling). Il s'est livré à des excès alcooliques. Il a commis des voies de fait. Il ne cesse de ménacer, et ne supporte aucun contrôle. Nous déclarons que pour sa propre sécurité, et pour la sureté d'autrui, il est indispensable de placer immédiatement Monsieur S. H. T. dans une maison de santé spéciale. JOHN ROSE CORMACK, E. BLANCHE."

"We, the undersigned physicians of the Faculty of Paris, went on Saturday, 17th October, 1874, at 5 p.m., by request of his wife and other members of his family, to visit Mr. S. H. T. at * * * * Paris. On our arrival at the appointed hour we found no one at home. In about twenty minutes Mr. S. H. T. came in, accompanied by * * * * and * * * * [two ladies]. His face was exceedingly flushed, and his manner very excited. He came up to us with outstretched arms, expressed great pleasure at seeing us, and immediately began boastfully to describe his recent purchases. He said that he had just bought at Binder's a very pretty carriage as a present for his sister, and that he must go out immediately to purchase horses for her. So intent was he on this project, that we had some difficulty in detaining him to converse with us, with a view to test his mental state. He would not sit down, and replied to our questions when walking about the room in an excited state. He told us that he did not know how he could spend his income of £2000 a year. 'Money,' he said, 'multiplies; and to prevent its increasing too much in my pockets, I must take care that I spend enough.' He said that on the previous day he had made purchases of pictures, vases, and other objects of art, to the value of £16,000. He went on to say that he intended to buy up all the pictures which were for sale—that with this object in view, he was going to take a journey in Belgium, Holland, and Italy. When speaking, Mr. S. H. T. several times burst out in fits of laughter.

"We learned from * * * * and * * * * that he had violently assaulted them on the previous evening. The latter had her face contused and discoloured by his violence on the previous evening, when driving home from dinner at * * * *

Under the circumstances, we declared to Mrs. S. H. T. and the other members of the family that we did not hesitate to advise for the safety of the patient himself, as well as for the safety of others, that he should be placed at once in a private asylum. Our advice having been accepted, we proposed to Mr. S. H. T. that he should forthwith accompany us to see some horses which were for sale. To this proposition he readily agreed. We then all three went downstairs and drove together to * * * *, a private asylum in * * * *. In our drive from * * * * to the asylum, Mr. S. H. T. continued to speak in an excited and irrational manner as to the impossibility of spending his income. He repeated several times, that he could not spend more than £240 for his own requirements, and that the remainder of his income must be expended in presents, pictures or otherwise. On arriving at, and on entering the asylum, he had not the slightest misgiving as to the place. Without offering any remonstrance, or in any way exhibiting distrust or unwillingness, he allowed himself to be taken first into a garden, and then into the room which he was to occupy. We did not accompany him from the garden to his room. We remained for an hour with the principal physician of the asylum, * * * * *, to know how Mr. S. H. T. accepted his confinement. When we left the asylum, we were informed that he was quiet, and that he seemed to be waiting patiently till some one should come to fetch him. He was visited daily [except on 18th] from the 17th to the 31st October, by Sir John Rose Cormack, one of the undersigned.

"On Saturday 31st October, we again together examined Mr. S. H. T. in the Asylum. He was not excited as on the 17th October. During the whole of our conversation, he remained seated and quiet. Where he sat, he could not see Sir John Cormack—but Sir John saw him, and heard all he said. The conversation was between Dr. Blanche and Mr. S. H. T. He seemed to remember correctly some of the incidents of the journey from * * * * to the asylum. When asked if he had comfortable quarters and was well taken care of, he said that he had nothing to complain of. He professed not to know the kind of house in which he was detained. He said that he saw nobody all day long—that he spent his time in walking in the grounds, in smoking, and in reading. He repeated his previous irrarational statements as to his inability to spend his annual income of £2000; and he insisted that no landholder in England—not even her Majesty Queen Victoria or the Prince of Wales could spend more than that amount. He spoke of having purchased a carriage for a friend—he did not say sister as on the 17th—and that he now required to buy a horse for that person, and three horses for himself. He spoke boastfully of the splendid furniture and pictures which he had purchased for his house in England. He stated that he was going to take a long journey with his wife. He did not express any wish to be allowed to leave the house where he was confined, nor did he manifest any displeasure at being there detained. This is the more *noteworthy*, as on the 25th he addressed Sir John Cormack in vituperative and abusive language for having brought him to, and for keeping him in the place where he was. This circumstance is in itself sufficient to lead us to believe that on the 31st October, he did not express to us all that was passing in his mind. We are confirmed in this opinion by having seen two letters which he wrote on that day immediately before our interview, one to * * * * [an old and intimate friend] and the other to his wife. He implored the former to 'get him out of this hell at once:' and the latter after some expressions of affectionate regard, he requested to send him some cigars.[1]

"At our visit on the 31st October, although we observed an improvement in his general appearance, we were very much struck with his intellectual enfeeblement, and reiterations of boastful, wild conceptions. These circumstances lead us to fear that the existing mental disorder may prove to be neither slight nor transient.

"Fears as to the probable gravity of the case are strengthened by his evident physical enfeeblement, as indicated by his attitudes and gait.

"From the facts now stated, we have come to the conclusion that Mr. S. H. T. is at present the subject of formidable cerebral disorder, manifested in acts of violence, in expressions of irritation and boastful conceptions, and that his being placed for the present in a lunatic asylum is imperatively demanded for his own safety and for that of others, and that the medical treatment now being followed—the continuance of which we recommend—cannot elsewhere be carried out. We are opinion that Mr. S. H. T. requires quiet of mind and body, and the use of tonic and antispasmodic medicines for the strengthening of his physical powers and calming the present excitement of the nervous system. The necessary treatment can only be carried out in an institution specially destined for maladies of this description. Were Mr. S. H. T. free to act as he pleased, he would not submit to lead that tranquil and regular life, which at present he so much requires—a life affording no provocations to excitement and no opportunities of excesses. The excessses from which it is specially necessary to protect Mr. S. H. T. are the use of alcohol and tobacco, which have certainly contributed to develop the state of cerebral disease under which he is now labouring.

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[1] The following is a copy of the letter to his wife referred to:— "My darling little Wifie, I am perfectly miserable here. Why Cormack keeps me here, heaven knows. Never a wink of sleep, not having you in my arms. Do beg of him to let me out, but I am afraid he will keep me here another week. Send me the right 50 cigars. Your own *loving* Husby."

"JOHN ROSE CORMACK.
"E. BLANCHE."

Mr. S. H. T. suffered at and from his marriage to the date of his seclusion from great sexual excitement combined with absolute impotence.

I continued to visit Mr. S. H. T. till the end of February, 1875, the date at which he was removed to a lunatic asylum in England.

During November, he improved considerably in bodily health, notwithstanding the supervention of a maniacal attack of some days duration. He was at times much dissatisfied with his surroundings. One morning he escaped from the asylum; but was brought back within half an *hour.*

On the 13th December, I made a report on his state for the guidance of his family and their legal advisers, an extract from which will show the nature of the case when fully developed, and when separated from the alcoholic and other causes of excitement by which it was at first obscured. "The character of the malady has never been so clearly disclosed as it now is; nor has its rapidly unfavorable progress ever been so threatening. On arriving at the asylum to-day, I learned that he was in a joyous mood, and would, no doubt, be pleased to see me. When summoned, he came at once to the room where I was waiting for him. Without any suggestion from me, and without any preface, he began to tell me what he was going to do when, within a week, he left the asylum, which, as usual, he spoke of as "this place." He described a church which he was going to build entirely of malachite at ———, near his residence in England. He minutely described a tour which he was going to make through France and Belgium with twenty superb carriages. The carriages, he said, were being built in England, and were to be waiting for him at Dover, on the 2nd June. He said that he expected me to travel with him—there would be a great many accidents on the journey from the crowds which would turn out to see him—and for each accident I should receive a fee of one hundred guineas. He made no mention of his wife or of any member of his family, when enumerating the proposed occupants of the twenty carriages. The chief subjects on which he spoke were his superabundant wealth, and the difficulty he had in keeping down its growth. He has passed urine and fæces unconsciously in bed for the last five nights. His gait is very unsteady—his step is shuffling and feeble—and his physical powers are rapidly deteriorating."

On the 15th December, he spoke to me much in the same strain. He said he was not, and never had been Mr. S. H. T. He was Viscount Enfield, and as such he would make a triumphal entry into England, when he was to be proclaimed King of the whole world. On the 26th December I saw him in consultation with Dr. Blanche. He was feeble from diarrhœa, but very joyous. His wealth, power, and Kingship of the world were the topics on which he descanted. His great desire was to get his "wand" from England. "Without my wand," he said, I cannot assemble my retinue of carriages and servants, nor without it can I get out of "this place."

Till his removal to England at the end of February, his mental and physical state remained very much the same. He rallied—but only for a very short time—after going to the English asylum. He is now (August 1876) much worse in every way than when he left Paris. He is going down in the usual way of persons stricken with the general paralysis of insanity.

Did space permit I should like to give the history of the three weeks of this patient's married life which elapsed between his marriage and his confinement in an asylum. The details which have been communicated to me afford abundant materials for a sensational volume of considerable psychological interest in illustration of a statement of Maudsley to the following effect:—"General paralysis is not always easy of diagnosis before the physical signs appear; and yet a man may at this stage get into trouble—get into the police-court, or get married foolishly entirely by reason of the disease."[1] On the day of his wedding

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[1] Maudsley (Henry):—Article Insanity in "System of Medicine," edited by J. Russell Reynolds. Vol. ii, p. 47. London: 1872.

Mr. S. H. T. narrowly escaped being taken to a police office for a breach of the peace. The day after his wedding he took railway tickets in London for himself and bride, but in passing from the ticket office to the waiting-room where he had left his wife he was hailed by an acquaintance who proposed to Mr. S. H. T. that they should travel together, whereupon the two gentlemen entered a carriage. The train started, the bridegroom without a thought of wife or baggage, leaving both behind. Three days of strange adventure elapsed before the separated pair were reunited. A week before he became my patient in Paris he struck a railway official for telling him to get out of the carriage at the opposite side from that which he was descending. He was immediately arrested; and remained four days in a French prison, whence he emerged by great favour on the payment of a sum of money to the man he struck.

The number of persons who come from England in a state of developing or threatening insanity to get well by travelling on the Continent must be large, judging from the cases of this kind which come under my professional notice every year. The custom is disastrous. To conceal and to cure, is the idea under which these unfortunates are sent abroad; but in general, the result is very different—a fatal impulse is given to the malady, for which quiet, and not the excitement of foreign travel, was required. One evening a gentleman (followed by two ladies) rushed into my study in a state of great excitement, and demanded an immediate report on his health. He had arrived some hours previously in Paris. He had come to travel on the Continent with his family to cure his melancholia. So I was told by his wife. I found him to be the subject of incipient general paralysis with suicidal mania. Early next morning, I requested a consultation with Dr. Henri Guéneau de Mussy. We met, and certified that he was a dangerous lunatic. He was on the same day removed to England under escort, and placed in confinement. This gentleman attempted to cut his throat with a razor during the same night he came to me. It was by my warnings that the precautions were taken which prevented that catastrophe.

General Paralysis of the Insane as described by Bayle and Calmeil, and as now generally understood by physicians, is a disease characterised by insanity and muscular paralysis. Usually the loss and disorder of mental power are manifested in an obvious manner before the muscular paralysis begins to show itself. Sometimes, however, the mind and the muscles exhibit almost simultaneously the morbid symptoms which indicate the malady; and in a certain number of cases the paralytic affection precedes the insanity. When, however, we are able to go well back into the history of a case reported to have exhibited paralysis prior to the insanity, it will often be found that there existed long before the latter was recognised a mental condition which when carefully reviewed we find to have been decidedly abnormal. Years before any one had supposed Robert James T. to be cerebrally diseased, he had exhibited eccentricities which in kind were similar to the insane extravagance with which at a later date he wasted his money on pictures and other objects which were in themselves worthless or which he did not require. From a practical point of view, the very early stage of this and similar cases is the most important; for it is then only that it is possible to arrest th ment of the disease. That it may often be possible to arrest the general paralysis of the insane in its nascent stage seems to be a legitimate inference from two facts—*first*, that in most cases the insanity is an advanced development of a pre-existing and often hereditary eccentricity, and that as a rule the insanity first shows itself as such in the opinion of the world under the influence of an exciting cause or causes among which may be mentioned political excitement, commercial anxiety, brain-fag, intemperance, marriage, and sexual excesses. These are not really the essential causes of the General Paralysis of the Insane—they are only exciting causes which waken up a latent inherent morbid state—a state which may be the sequel of a fever or an hereditary predisposition—which with the observance of mental and physical precautions might possibly have remained in perpetual abeyance. Cerebral congestion, inflammation and deterioration of brain-tissue with insanity and paralysis—their expressions—might have remained for ever dormant, and practically non-existent. This is a field in which practical physicians may achieve great successes; but unfortunately, like other fields within the domain of preventive medicine, it is one into which they are seldom allowed to enter. The false notions afloat in the public mind on the subject of insanity, by militating against its early treatment, constitute a great social evil. Families and friends conspire as it were to conceal, and if possible ignore, the existence of acquired or hereditary tendencies to cerebral disease. Till public opinion cease to view insanity as an individual or family stigma, and not in its real light as a disease — often preventable in its premonitory and early stages—the state of the mental invalid will be kept a carefully guarded secret, till, concealment becoming impossible, he is hurried into a lunatic asylum as a certificated madman with his brain-disease very probably advanced beyond the possibility of cure.

The means of preventing cerebral disease in those hereditarily or otherwise predisposed to it, and the treatment of it in the incipient and early stages, when cures are possible, have not, from the causes alluded to, sufficiently occupied the public nor the general body of the medical profession. It is, however, rather the public than the profession which requires to be educated in this momentous medico-social question.

I have lately reviewed my recollections of several early and intimate friends who have become insane. All, I find, exhibited, to my own knowledge, decided mental peculiarities showing themselves by eccentricities in manner, or by oddities—more or less marked—in thought, conduct, and conversation. In all, the subsequent insanity was an exaggeration of peculiarities which in their original form were in some persons disagreeable blemishes, and in others very agreeable traits of racy originality in character, conduct, and conversation. It is impossible not to feel that, at least, in some of these sad cases, there existed a transition stage—a stage in which the material changes in the brain were as yet so slight as to admit of cure, or arrest, by removing the exciting causes under which they arose, and which it is now easy to see, were overlooked so long by relations and friends as to have been allowed to work irreparable mischief.

I have also reviewed in contrast with the history of friends who have become insane, the history of other friends whose mental soundness has never been challenged, but whose mental eccentricities and peculiarities through life have been apparent at least to some of their intimate associates. T impression left on my mind is that some of the second category who have escaped insanity owe their preservation to wholesome occupation, sound domestic life, and the affectionate guidance of those who knew when and where to sustain weakness, and when and where to curb inordinate energy and ambition. By advising how this guidance ought to be conducted, and by occasionally intervening by medical treatment, the family physician has much in his power; and therefore we may hope that when brain-diseases become more studied and treated by general physicians the helplessly insane will become a less numerous class than at present.

In some families, cancer, consumption, gout, or insanity, "is in the blood"—is hereditary—but these maladies do not manifest themselves merely in virtue of a blood-taint, a congenital abnormality in the constitution of the nerve-element, or a predisposition. The evolution of these diseases requires favouring circumstances and immediately exciting causes. By excluding the operation of these circumstances and causes, are not predisposed individuals often saved?

XV.

SHORT ATTACKS OF INSANITY IN WOMEN:

REMARKS ON HALLUCINATIONS.

SHORT ATTACKS OF INSANITY IN WOMEN:

REMARKS ON HALLUCINATIONS.

Short Attacks of Insanity arise from various causes, and assume different forms. There are short attacks which might have proved prolonged, recurrent, or incurable, had they been mismanaged; and mismanagement is apt to occur in sudden manifestations of cerebral disorder from the prevalent belief that "mental disease" exists, independent of bodily causes. The term "mental disease" cannot be superseded; nor, indeed, is it objectionable; but it is well to remember that it has sometimes a misleading tendency, by seeming to imply that a disease of the mind may exist irrespective of any material morbid condition; whereas, all the psychological phenomena called insanity and delirium, are dependent upon congestions and lesions of the brain, visceral diseases and disorders, or poisons in the blood.

Women at all ages, but particularly women at the epoch of puberty, and during the period of ovarian activity, are more subject than men to attacks of transient insanity. The principal immediate causes on which these attacks depend are peculiar to the female sexual system. Transient insanity is, however, occasionally met with in males; and it occasionally occurs in females when there is no discoverable cause connected with the function of reproduction.

The principal causes of short attacks of insanity in women are—ovarian excitement from different causes—pregnancy—parturition—and delivery. In both sexes, short attacks of insanity may be caused by toxæmia—large accumulations of fæces in the intestines—the abuse of stimulants—and the transition from celibacy to married life. In these causes originate most of the cases belonging to the group indicated by the title to this article. The extreme irritability and waywardness manifested by some women when menstruating is familiar to physicians; it may exist so mildly as hardly to attract notice, or it may exist in so severe a form as to amount to "insanity." Women liable to these periods of waywardness and irritability inhabit—to use a title-page phrase of the late Dr. Andrew Wynter—"the border-land of insanity," and are always in danger of being driven across the uncertain boundary into the recognised domains of madness.

The following case occurred in the summer of 1842, in Edinburgh. It was published in the *Edinburgh Monthly Medical Journal* for October, 1843.

Transient Mania in a Patient aged 17, *in Connection with Acute Suppression of the Menses, and Constipation for Six Days.*

About midnight, I was hastily summoned to visit a servant-maid whom I had seen in the morning, apparently in perfect health, when I was visiting her mistress: she was a plump, healthy-looking girl of 17, well-formed, rather under the ordinary stature, with dark hair and eyes. I found her screaming, talking incoherently, and dangerously violent to those around her, whom she made frequent and determined attempts to bite, and to strike with her hands and feet. Soon after my arrival, she ceased to speak or utter any sounds; but her violence increased. By answers to my questions addressed to her fellow-servants, I soon learned the nature of the case. During the previous day, the catamenia had appeared at the usual monthly period, but had on that afternoon been suddenly arrested in consequence of exposure, with bare legs, to a sharp cold wind when tramping clothes in a tub of cold water.[1] She had been so engaged for an hour. About six in the evening she complained of cold, general shivering, pains in the head and lower part of the abdomen. By the advice of a fellow-servant, she bathed her limbs in warm water, took a dose of sulphate of magnesia, and went to bed, where she had some troubled sleep. Between ten and eleven o'clock she rose, and without putting on any part of her dress, joined her fellow-servants in the kitchen. It was remarked that her manner was peculiar and excited, but not violent. The excitement increased rapidly: and about midnight, when I was sent for, she was violent and quite maniacal. The first symptom of fury which she manifested was tearing her night-dress with her teeth. When I arrived, three women were endeavouring to hold her; but she seemed to have more strength than they all combined, and was only very partially controlled by them. The skin was hot and dry. The pulse was full, quick, and somewhat corded. She was almost naked, and had lost all sense of shame. She is naturally a modest, and rather timid-looking girl.

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[1] This is, or at least used to be, a common method of washing i
Scotland.

After great difficulty, we succeeded in tying her limbs together, and fixing them to the frame of the bed. I then—the arms and head being secured by the women—forcibly opened the jaws with a piece of wood, and introduced four drops of croton oil mixed with moist sugar, into the back part of the mouth, expecting the speedy and twofold benefit of its producing, in the first place, muscular weakness, by exciting nausea, and then evacuating the bowels, which, according to a statement she made on taking the sulphate of magnesia, had not been opened for six days.

No apparent effect being produced by the croton oil in half an hour, I repeated the dose, soon after which her muscular energy somewhat diminished, and slight indications of nausea were apparent. She still, continued, however, to be unnaturally strong and dangerously violent. At this time, supposing that she was becoming more tranquil, and to some extent exhausted, the restraints were rashly loosened. After one or two minutes of repose, she sprang from our grasp, and fixed her teeth—fortunately only for an instant—in the fleshy part of my fore-arm. As I had taken off my coat, to be more able for my hard work, the wound inflicted was rather painful, and it left a mark for several weeks.

As the measures employed had not fully succeeded, I directed a lavement to be prepared, containing an ounce of turpentine and ten drops of croton oil. Cold water was then poured on the head and chest in a full stream. After this, she became quieter, and, without much difficulty, was laid in bed and held during the administration of the enema. In less than five minutes after the enema had been given, she became calm, and her countenance rapidly—I might almost say suddenly—exchanged its wild maniacal expression for a look of mingled softness and surprise. Almost at the same moment, assigning motives of delicacy, she requested me to leave the room; and I hardly had had time to do so, when her bowels were very freely relieved, before she could be brought to the night stool already placed in readiness at the bed side. For some minutes the evacuation from the bowels continued, the quantity passed being enormous. A large part of it was scybalous; the colour was darker than natural; and the smell was exceedingly offensive. In less than twenty minutes the operation of the croton oil having quite ceased, she fell into a profound sleep and perspired profusely. I left her in this condition at 4 a.m., having been with her about four hours. She had not been unmanageable for more than half an hour before I saw her.

When I returned to visit her at 10 a.m., I found that the bowels had been once again very freely moved, the excretion being of a tarry colour and consistence, with a very bad odour. She complained of a general feeling of weariness with a sensation of being bruised in every part of the body. She assured me, and I believe with perfect sincerity, that she had no recollection of her outrageous conduct. She stated that she felt some confusion of ideas; but I could detect nothing in her manner indicative of this; and she was restored in every respect to her usual mental condition, so far as observation of, and conversation with her could decide the point. I directed that her wish to have tea and bread for breakfast might be complied with—ordered her to remain quiet in bed—and prescribed no medicine.

At 10 p.m. I saw her again. She was very much as in the morning, except that she was somewhat restless and troubled with pain in the lower part of the abdomen. By my directions, she was placed in a hot hip bath, and upon her return to bed warm fomentations were applied to the bowels.

Next morning, though she had still a jaded look, she declared herself to be quite well; and I was informed that it was with some difficulty that she had been prevailed upon to remain in bed till my visit. I ordered a dose of castor oil, as her bowels had not been again moved. I allowed her to go next day by railway to her father's house near Linlithgow, as her mistress was alarmed at having such an inmate.

She went to Linlithgow, where she remained some weeks under the judicious medical care of Mr. Baird who treated her with chalybeate tonics after getting the bowels into a right state. This treatment proved quite successful. The catamenia appeared at the next period. She returned to her service in Edinburgh in perfect bodily and mental health; and for about two years after the attack remained as a servant in the same house in the enjoyment of perfect health. After that time, I lost sight of her.

When I originally published the case now described, I placed beside it the history of a case described by Dr. Merrem in the *Medicin. Zeitung von Preuss.* Verrein, No. 51, 1842. A short attack of terror and hallucinations occurred in connection with acute suppression of the menses.

A woman, 23 years of age, suffered a chill on the 23rd August, in consequence of which the catamenia were suppressed. She complained of languor and lassitude. She nevertheless went through her work as usual, till the beginning of September when—being in the harvest field with her brother-in-law, she suddenly cast an alarmed look at him, and asked—why he was altered and dreadful in appearance?—and immediately took to her heels and ran home. On reaching her home she described the dreadful appearance of her brother-in-law, and looked with dismay at her hands, and said they were the paws of a dog. From this time she would neither eat nor drink, became suspicious of every one, and never slept. Dr. Merrem was called to the patient on 2nd September, when he found her greatly agitated. Alternately she looked around her, and at her limbs: and then she ran to hide herself in a corner. When left alone with Dr. Merrem, she spoke with great distress of her transformation into a dog, and complained of noises in her ears, and of constipated bowels. The face was flushed but not hot, and the eyes were sparkling. The temporal arteries were pulsating strongly: the pulse of the radial artery was 75, small, and corded. The tongue was clean. The chest and abdomen were free from pain.

Cupping-glasses were ordered to be applied to the insides of the thighs. Stimulating pediluvia and infusion of senna combined with extract of gratiola were also ordered. After several doses of these medicines had been taken, ten grains of Dover's powder were given at bedtime. She passed a pretty good night, and suffered less from the noise in her head. There had been no alvine evacuation. On the 6th, she felt a little better. A strong dose of senna was administered, which operated smartly. A large quantity of blood was taken from the thighs by the cupping-glasses. In two days she was completely restored, and going on with her work as usual.

Head symptoms of every kind and degree—from slight giddiness to mania—seem to be produced by ovarian irritation. Physicians in the habit of examining the abdomen in cases of ovarian congestion and inflammation are familiar with the cerebral phenomena which pressure on the sensitive ovary sometimes suddenly produces. Some patients will faint and some will vomit, and some will have an hysterical attack: others will only feel slightly giddy or have transient dimness of vision. When the ovarian irritation is more intense, the cerebral disorder is also more intense and may even amount to mania.

Case of Miss T. E.—*Mania with Erotic Manifestations from Ovarian Irritation: Hereditary Predisposition to Insanity: Recovery.*

On the 30th October, 1875, I was asked to receive, with the least possible delay, into the Hertford British Hospital, Miss T. E., aged 29, an English governess, who I was told was being attended by a physician for typhoid fever at the residence of the family with whom she lived. On the representation that she could not receive the necessary care where she was, I granted her immediate admission.

When admitted on the afternoon of the 31st October, she was in a state of maniacal excitement. It was with great difficulty that she was undressed and put to bed. The persons who brought her to the hospital left without giving any account of her, or of her illness. She had moderate diarrhœa—some tympanitic distension of the abdomen—and evinced pain when pressure was made in the right iliac region. It was evident that the diagnosis under which she had been sent to the hospital was incorrect, while it also seemed that at first it was partly justified by the symptoms. I saw the patient for the first time at the ordinary hospital visit on the morning after her admission.

31*st October.*—The patient is menstruating; but the flow is scanty, and has only begun since her admission. On making pressure over the right iliac fossa, no gurgling is perceived; but great pain seems to be excited. Her incessant loud talking and screaming alarm the other patients. She is at present in a strait-waistcoat which Mr. J. Hocart found it necessary to put on her during the night, in consequence of her violence and her indecent gestures. Before physical restraint was employed, she had torn her night-gown in shreds and exposed herself in a state of nudity: she afterwards became somewhat quieter, but all night she continued to rave on religious subjects and on the preparations which she fancied were being made for her approaching marriage. Her pulse was 100; and her temperature 39 Cent.

An ointment containing belladonna was applied over the seat of pain, and the abdomen below the umbilicus was covered by a poultice.

The following potion was prescribed:

℞ Bromidi potassii, ʒij;
Chloral-hydratis, ℈ij;
Hydrochloratis morphiæ, gr. ¼;
Syrupi aurantii, ℥j:
Aquæ camphoræ, ad ℥vj.

Half an ounce to be administered every two hours till the patient become decidedly calmer, when the interval is to be prolonged to four hours or longer.

Not having a separate room for the patient it was necessary to have her removed from the hospital, as her turbulence and noise were proving injurious to the other patients. With the view of accomplishing this object, and explaining the real nature of the malady, I made a request to the family with whom she had been living to send some one to meet me next morning at the ordinary hour of visit.

Next morning a lady came at the appointed hour, who gave an account of the patient's state of health before the supposed typhoid fever for which she had been received into the Hertford British Hospital. As the patient had nearly ceased to be noisy, and no longer required the restraint of the strait-waistcoat, I consented to allow her to remain for another day or two, and in the mean time telegraphed to one of her near relations, whose address I had obtained, stating that she could not remain in the hospital. In obedience to the telegraphic summons, a lady from England met me at the hospital next morning. From her and the lady in whose family the patient was resident governess, the history of the case was fully obtained. The principal facts are to the following effect.

The patient's father, a clergyman retired from duty, about 70 years of age, is a lunatic living at home under the eye of a trained attendant. He has on several occasions been confined in lunatic asylums. Several members of the family have been confined as insane persons; and other members who have not required to be secluded, have been remarkable for their oddities and eccentricities. The father has had three wives and is now a widower. The present feature of his mental infirmity is the plan he is pursuing to obtain a fourth spouse. He writes proposals of marriage to all the marriageable young ladies whose addresses he can obtain and with whose fitness to be his wife he believes in. Every proposal-letter is copied in a book, and if a reply be received, it also is copied. He is sometimes exasperated by refusals; but is never discouraged by them from endeavouring to secure a partner. During many years when he was a very troublesome and dangerous lunatic, his daughter, the patient, Miss T. E., dutifully cared for him, to the detriment of her own health. She has never been insane, nor has she ever had any nervous attack approaching in seriousness to that for which she was received into the Hertford British Hospital. She has, however, for several years shown excitement and peculiarity of manner for one, two, or three, days at each monthly period. Since coming to Paris it would appear that her excitement and altered behaviour have increasingly manifested themselves at these times, and have been remarked upon by her acquaintances. During the intervals, she has been sprightly in manner and diligent in the performance of her duties. The facts as now stated show the case to be one of acute mania from ovarian irritation in a subject in whom heredity existed in an intense degree as a predisposing cause of insanity.

To return to the history of the attack which brought the patient under my notice.

1st *November*.—During the night she delivered rambling religious discourses, and spoke wildly of her marriage, which she said was to take place in the evening. When I saw her about 11 a.m., she was very much excited and seemed to be replying to imaginary voices as to the mode of laying out the wedding-breakfast. She asked me to go down stairs and see how beautifully the table was adorned with fruits and flowers. She then threw her arms around a gentleman—an entire stranger to her—who was with me and announced that he was to be her husband in a few hours.

2nd November.—The maniacal excitement has greatly subsided. During the afternoon, she was removed to the Château de Suresnes to be under the care of Dr. Magnan till her health was re-established.

Seven days afterwards I saw her at Suresnes when she spoke and acted in every respect like a sane agreeable lady-like person. She remained under Dr. Magnan's care till after the next monthly period. It passed with very little perturbation of the nervous system and without almost any pain in the ovarian region. Some months afterwards, I heard that Miss T. E. was in England and continuing in good health at the monthly periods, in anticipation of which she kept very quiet and took large doses of bromide of potassium, and used for a few days before the flow began frequent warm pediluvia and warm applications to the lower part of the abdomen.

This history is very instructive, showing how much may be done by rational and simple treatment in the class of cases to which it belongs, both to relieve and prevent maniacal attacks and minor manifestations of insanity caused by ovarian irritation—even when the subject has in a high degree the hereditary tendency to mental disorder.

Case :—*Melancholia with Hallucinations supervening immediately after Marriage in a Case of Prolonged Constipation: Recovery.*

On a morning in the summer of 1875, an English gen- an sent me an urgent request to visit his wife at an hotel. On my arrival, I found him waiting for me at the door of the lady's room to prevent me from entering till he had somewhat explained the principal facts of the case. He told me that they had been married in England on the morning of the previous day, and had two or three hours after the ceremony started for Paris, which they reached seven or eight hours before my visit. The marriage, he informed me, originated in deep mutual attachment; and the Continental wedding trip was in accordance with a matured and long cherished plan. He assured me that the lady's health had always seemed unexceptionable till the day of the marriage, when he observed that she looked pale and weary. Soon after they had commenced their journey, she passed into a state of profound grief, became peculiar in her manner, and begged her husband to pardon the injury she had done him in marrying him, as it was a step taken in ignorance. Since leaving England she had refused food and wine, and had not closed her eyes even for one minute. On reaching her room in the hotel, she placed herself in the arm-chair, in which she remained till I found her sitting in it with a weak pulse, furred tongue, and fear-stricken face. Despair and profound melancholy ruled her features. Her looks proclaimed her to be a prey to overwhelmingly distressing fancies.

It required perseverance and patience to elicit the information necessary to enable me to ascertain the nature of the case. The principal facts I, however, at last ascertained in a very complete manner from the patient herself in a private interview. When she had confided to me her great sorrow, she answered all questions willingly and with precision. In reply to variously put questions and urgent entreaties, she said that her profound dejection arose from her marriage, which was a crime certain to make her husband for ever miserable. "Before to-morrow," she continued, "my face, bosom, and perhaps my arms, will be covered with coarse hair, and I shall be hideous to look at." She said that for some days she had experienced intense irritation under the skin of the face, breasts, and arms; but that it was not till after leaving the church, a married woman, that she realised the fact that there was coarse hair under the skin which must soon become visible and make her loathsome to her husband, herself, and everybody. In answer to my inquiries, she told me that her bowels had not been moved for twelve days, although within some days of her marriage she had several times taken aperient pills and large doses of the sulphate of magnesia. Menstruation due ten days before her marriage was still impending.

After much persuasion, she undressed and went to bed, after taking a cup of strong coffee with brandy, which I had prepared for her. When she was in bed, I examined the abdomen by palpation and percussion. I found that there was an enormous accumulation of solid matter in the large intestine, and that the bladder was considerably distended. There was neither tenderness nor tympanitis of the abdomen. I drew off a large quantity of very dark mahogany coloured urine by the catheter, which she said gave her great relief, although before the operation she stated that she had no uneasiness in the lower part, or in any part of the abdomen when it was being explored by palpation and percussion.

My visit extended to nearly three hours; and I did not leave till I had put the patient under charge of a competent nurse. I prescribed a cordial mixture containing bromide of potassium, and personally administered the first dose of this potion. In each tablespoonful there were ten grains of bromide; and I directed that the patient was to have, in addition to the dose she had taken, one tablespoonful every hour till three tablespoonfuls had been taken, soon after which time I promised to return. I also directed two pills containing five grains of calomel and one grain of the extract of belladonna to be given forthwith, and a purgative clyster with glycerine as soon as there was an incipient sensation of a desire to go to stool. I likewise ordered that her alimentation was to be limited to two teaspoonfuls of undiluted Brande's essence of beef every quarter of an hour, adding to each dose a teaspoonful of brandy should she seem faint. The restricted administration of food seemed a prudent precaution, as nausea was being much complained of.

On my return about noon, I learned that all my instructions had been carried out. Forty grains, therefore, of the bromide of potassium had been taken, including the dose administered during my first visit, and her altered condition gave unquestionable evidence of the beneficial and characteristic influence of a bromide. She assured me that on pressing her cheeks, chin, lips, and other parts of her body, she could feel the points of the bristles as if they had already come through the skin; and she was always greatly surprised on looking at her face in the glass to discover that they were still invisible. Her hallucination on this point, and her belief in the hideous appearance with which the eruption of hair was about to invest her, remained rooted in her mind as firmly as in the morning; but it no longer occupied her mind to the exclusion of every other idea.

Before continuing the narrative a few remarks may be made on the facts already stated. The state of comfort and tranquillity which the patient enjoyed, as compared with her condition before she began to take the bromide was so very remarkable, and at the same time so exactly characteristic of the therapeutic action of the drug, that it is reasonable to conclude that the bromide was the agent to which the amelioration of the patient was *chiefly* due. Another important beneficial agency had been, however, in operation simultaneously in point of time with the bromide —the horizontal position of the patient. In certain cases of melancholia and profound hypochondriasis, I have repeatedly observed that rest for some hours in the recumbent position has caused a remarkable diminution in the intensity of the mental depression and in the dominating power of hallucinations. Cerebral anæmia was a marked feature in the cases to which I refer. In conjunction with Dr. B. Ball, I lately treated a French military officer in whom profound melancholia and various hallucinations were associated with recent cystitis, enlarged prostate, and old dyspepsia. We observed at a very early stage of the treatment, at a time when the mental symptoms were alarming, that there were two conditions under which both the melancholia and the hallucinations manifestly moderated in intensity—the one was lying flat on the back, and the other was taking fifteen grains of bromide of potassium. When the influences of the two conditions were combined, the relief was so great on several occasions, as to lead the patient's family to believe that he was almost cured. Each influence, however, without the other, produced its own prompt and decided benefit. So marked was the relief from the separate influence of the recumbent position, that periods of recumbency constituted an important part of the treatment, whilst other therapeutic means of slower action were being brought to bear on fundamental causes—the enlarged prostate, the cystitis, the dyspepsia, and the anæmia, had had time to exercise their influence. The benefit arising from recumbency showed that there was a want of arterial blood in the brain. With some, and formerly with myself, that would have contra-indicated bromides, from a belief that their therapeutic action depended on the causation of a condition allied to cerebral anæmia. I have now learned that the promptly calmative, and almost reason-restoring effects of a bromide, are equally conspicuous in cases in which there exists cerebral anæmia or hyperæmia. This important clinical fact is perhaps not generally recognised by physicians.

Particular attention is due to the almost immediate benefit derived by the anæmic bride from taking forty grains of bromide of potassium in five hours, and being during that period, in the recumbent position. The bromide had considerably steadied and restored the mind before any way had been made in the fundamental treatment of the case by unloading the intestinal canal. It often happens in that wise. Under more or less similar circumstances, we may frequently achieve for our patients a sort of *provisional cure* by bromide of potassium, bromide of ammonium, bromide of camphor, or some other bromide, whilst we are waiting for the therapeutic opportunity to give other necessary or more essential remedies.

The improved strength and normal temperature of the patient, together with the absence of symptoms pointing to hernia or inflammation, indicated the propriety of proceeding with the treatment by purgatives. Three pills were prescribed, each containing three grains of calomel, and half a grain of the extract of belladonna. I directed one to be given every hour till the three had been taken, and two hours after the third pill, three drops of croton oil should there have been no action of the bowels. I returned in about five or six hours, arriving just after the croton oil had been given. Some abdominal uneasiness existed ; but the patient was more composed. On returning two hours later, I found that there had been no alvine evacuation, and that the abdominal discomfort was now positive pain. A large enema of tepid water was forthwith administered, which was followed in a few minutes by a rapid succession of enormous evacuations of indurated fæces. After the evacuation the patient was much exhausted, but immediately rallied on taking a tumbler of hot brandy and water. She fell into a deep sleep and awoke in four hours evidently refreshed. After taking food she again fell asleep, and with the exception of short intervals slept till my next visit, 8 a.m.—about twenty-six hours from my first seeing her. The countenance though much improved, wore an expression of profound sadness. Her conversation too was deeply tinctured by the hallucinations of the previous day. She had, however, come to the conclusion that the hideous eruption of hair was a more distant calamity than she had supposed. The day passed without any notable incident. She drove out in the evening, and occasionally seemed interested in surrounding objects. Next day—the third day—after I had explained the nature of her case, she promised to try to believe my explanation. I added citrate of iron and quinine to her bromide of potassium mixture, the doses amounting to six grains of the former and thirty grains of the latter in the twenty-four hours. For two days she took no other medicines. For the next three days she continued to take the mixture, and likewise an ounce of the *Br. Ph.* compound decoction of aloes before dinner.

On the evening of the seventh day of my attendance, the couple left for Switzerland. The patient said she was ashamed when she recollected the hallucinations and causeless depression of spirits which had tormented her. She imputed the state in which I found her on the morning of her arrival in Paris, to the manner in which she had neglected her health, and to there having been too great a strain upon her mind. in making the preliminary nuptial arrangements. Nevertheless the morbid fancies had still some place in her mind, for she confessed to me that the dreaded hairiness haunted her in her dreams ; and that the first thing she did on awaking was to examine her face in the mirror. Till she had tested her skin by sight and touch, the morbid fancy that a hairy eruption was impending, was apt to worry her more or less. She was now always able, however, speedily to realise that the fancy was morbid.

At the end of a week, her husband wrote to me to say that his wife was in perfect health—quite herself again—and enjoying the new and interesting scenes she was visiting. About three more weeks elapsed without my hearing anything of her. I then received a telegram from her at a town a hundred miles from Paris, requesting me to go to see her husband who was very ill. I was much pleased on arriving to find that his supposed diphtheria was only a severe attack of quinsey. The lady was naturally in an anxious and excited state, till I gave my favourable prognosis ; but she showed no traces of the former illness. In a few days, the couple came to Paris on their homeward journey. During their sojourn of a few days, I saw them several times. They were both in excellent health and spirits when they left for England ; and were ending happily their chequered sojourn on the Continent.

This case enables us to examine an insane hallucination in its nascent form. It throws a precise light—I do not say a *new* light—upon the nature of hallucinations, and indicates where to draw the line between hallucinations which do, and those which do not constitute proofs of insanity.

When an individual receives deceptive information from one or more of his senses, he is the subject of a hallucination or hallucinations; but there is no insanity in his case, if by the corrective influence of his judgment he discover the information to be deceptive.

The simplest and most familiar examples of hallucinations existing irrespective of insanity are afforded by patients who have had legs amputated, experiencing—or rather feeling as if they experienced—pains in the non-existing toes. These, my friend, Dr. Benjamin Ball, of Paris, correctly says are hallucinations; and in support of that view he states that it is also the opinion of Baillarger and Falret. "Many alienists" says Dr. Ball, "object to this phenomenon being classed with hallucinations: it presents, nevertheless, the two characteristics which belong to them of being *external* and *spontaneous;* and any difference between it and other hallucinations consists in the precise evidence which it affords of its essentially material cause."[1] Dr. Ball gives an apt illustration of his statement by citing a case communicated to him by a friend. Dr. Perier had amputated the leg of a young child. When the operation was performed, the patient was under the influence of chloroform, and for a considerable time afterwards remained in ignorance of what had taken place. One day, he was seized with an acute attack of itching in his foot; and it was the vain attempt to scratch it, which led him to discover that it had been removed. In what, asks Dr. Ball, did this false sensorial perception differ from a hallucination?

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[1] BALL (Benjamin):—Leçons sur Les Maladies Mentales. *Premier Fascicule*, p. 76. Paris, 1876.

Following out the same theory of hallucinations, Dr. Ball says that when a lesion analogous to that which existed in the amputated child is produced in the course of the auditory or optic nerves, the patient will experience sensations which in respect of these special nerves are the equivalents of pain. "The patient," he remarks, "will *see* flames and luminous points—he will *hear* whistling, buzzing, the crack of a whip, or the report of a musket. This is an answer to the old objection, based on the fact that hallucinations of sight and hearing have often been met with in persons whose optic and auditory nerves had become wholly degenerated. Similar lesions may very well determine sensorial impressions of an entirely subjective character. It is in this way that structural changes of the spinal cord give rise to the tinglings of paraplegia, to the lancinating pains of ataxia, and to the feeling of constriction experienced by many patients."

The case of the bride instructively connects the subject of dreams with that of insane hallucinations, and throws light on both. If, as I have said, insane hallucinations be more or less developed sense-deceptions uncorrected by the exercise of the judgment, so are many dreams sense-deceptions developed by the temporary exclusion of the external world and the temporary suspension, incident to sleep, of the volitional control over the current of thought.

This class of dreams Abercrombie has described as consisting in "trains of images brought up by associations, with bodily sensations." Gregory the eminent Professor of Edinburgh, author of the *Conspectus Medicinæ*, left behind him a manuscript which his son Dr. James Gregory presented to Abercrombie, who speaks of it as containing "a variety of curious matter" on this subject. In this paper, Gregory mentions of himself, that having gone to bed with a vessel of hot water at his feet, he dreamt of walking up the crater of Mount Etna, and of feeling the ground warm under him. He had ascended Vesuvius at an early period of his life, and had then actually felt a strong sensation of warmth under his feet. The dream being of Etna and not of Vesuvius, is explained by his having recently read Brydon's description of the former. On another occasion, Gregory dreamt of spending a winter at Hudson's Bay, and of suffering much distress from the intense cold. He found that he had thrown off the bed-clothes in his sleep. The bodily sensation of cold so produced, brought up images associated with an account, which he had been reading a few days before, of the state of the Hudson's Bay territory in winter. Referring to Gregory's manuscript, Abercrombie says:—"The most striking anecdote in this interesting document is one in which similar dreams were produced in a gentleman and his wife at the same time and by the same cause. It happened at the period when there was an alarm of French invasion, and almost every man in Edinburgh was a soldier. All things had been arranged in expectation of the landing of the enemy, the first notice of which was to be given by a gun from the Castle, and this was to be followed by a chain of signals to alarm the country in all directions. Further, there had been recently a splendid military spectacle in which five thousand men had been drawn up in Prince's Street, fronting the Castle. The gentleman to whom the dream occurred, and who had been a most zealous volunteer, was in bed between two and three o'clock in the morning, when he dreamt of hearing the signal gun. He was immediately at the Castle, witnessed the proceedings for displaying the signals, and saw and heard a great bustle over the town from troops and artillery assembling, especially in Prince's Street. At this time, he was roused by his wife, who awoke in a fright in consequence of a similar dream, connected with much noise and the landing of an enemy, and concluding with the death of a particular friend of her husband, who had served with him as a volunteer during the late war. The origin of this remarkable concurrence was ascertained in the morning to be the noise produced in the room above by the fall of a pair of tongs, which had been left in some very awkward position in support of a clothes-screen."[1] In the same chapter from which this extract is taken Abercrombie mentions, among other curious illustrations of this subject, that Reid (the metaphysician of Edinburgh) relates of himself, that the dressing applied after a blister on his head having become ruffled so as to produce considerable uneasiness, he dreamt of being scalped by savages.

Cases precisely similar in character to the above often-quoted cases of Abercrombie are of frequent occurrence. I could give several very remarkable examples from recollections of my own dreams, and from the experiences in dreaming communicated to me in conversations with friends when discussing with them the relationship of some of the hallucinations of insanity to the dreams in which scenes and images are conjured up by bodily sensations. An instructive case occurred to Dr. Ball. With his permission I mention it in this place.

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[1] ABERCROMBIE (John):—Inquiries concerning the Intellectual Powers and the Investigation of Truth, p. 280. *Second Edition.* Edinburgh, 1831.

Dr. Ball dreamt one night that he was fighting a duel with pistols upon the rocky shore of a desert island. He fired at his opponent and missed him. Dr. Ball was immediately thereafter shot through the head; but to his great astonishment did not drop down. Again he fired and missed; and again he was shot through the head, the bullet entering at exactly the same place. The duel continued; and Dr. Ball was shot ten or twelve times, in succession, till at last he awoke with an intense lancinating neuralgia, the seat of which corresponded exactly to the point which had been struck by his opponent's bullets—while the interval which separated each neuralgic lancination accounted for that which separated each discharge of the pistol.

This case shows most distinctly how a definite sensation during sleep will sometimes originate a whole train of ideas which in the waking state would be put aside at once by the judgment, but are transformed during the evolution of a dream into a complicated history accompanied by positive hallucinations of several senses. Dr. Ball in his dream *saw* the person of his opponent, and *heard* the report of the pistol, although he was not at the time affected by any disorder of the senses of sight or hearing.

END OF VOL. II.

POSTCRIPT.

PARIS: *1st October*, 1876.

TWELVE months ago, the now completed volumes of "CLINICAL STUDIES" were announced as nearly ready for publication. Since that announcement was made, a succession of family illnesses and bereavements have rendered it irksome and difficult to attempt more than the imperative daily routine of professional duty. This circumstance is my apology for the delay which has occurred, and an explanation of some widely-separated dates attached to a few additions interpolated when the printing was in progress.

J. R. C.

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